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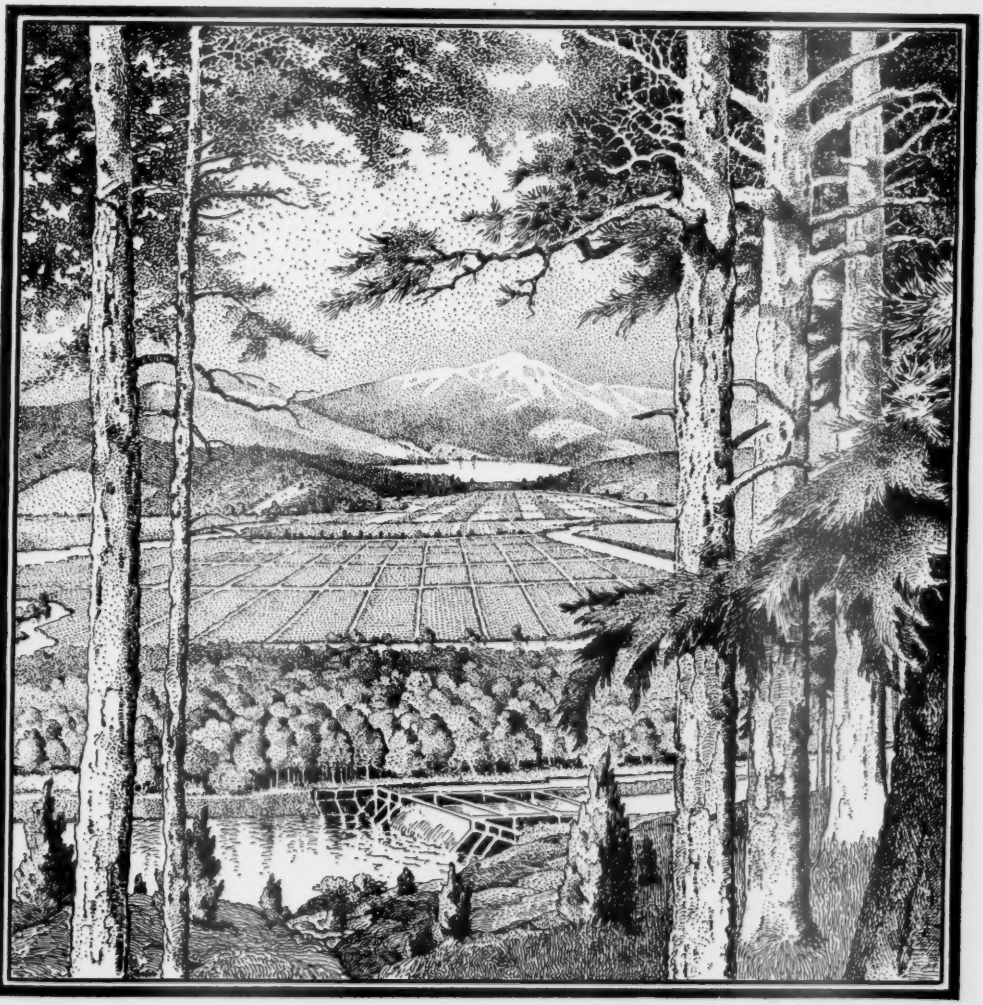
# FORESTRY & IRRIGATION



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**The objects of the Association, as set forth in its Constitution, are as follows:**

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

# Forestry and Irrigation

H. M. SUTER, Editor and Publisher

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SCENE IN A LONGLEAF PINE FOREST.

# Forestry and Irrigation.

VOL. VIII. JUNE, 1902. No. 6.

## NEWS AND NOTES.

**Irrigation Bill Passed.** The Irrigation Bill was passed by the House of Representatives on Friday, June 13, by a vote of 146 to 55. As the bill had already passed the Senate, it is now only a matter of the agreement of that body to the House amendments, when the measure will be laid before the President for his signature.

The passage of this bill has been accomplished by the well-directed efforts of its friends. It passed the Senate the first of March without trouble, but the outcome in the House was considered doubtful. Various committee amendments improved the bill in detail, and in this way considerable opposition was avoided. The opposition of the eastern members to a measure that they felt "would bring competition to the farmers of the east" was to a great extent overcome when the purposes of the bill were more fully understood. That the bill gained steadily in favor is readily seen when it is considered that in the beginning its fate in the House seemed doubtful, while in the end it was passed by a large majority. To the men who handled the bill on the floor of the House great credit is due. When the time for action came, they were present and handled the measure with skill. This was in striking contrast to those members in charge of the forest reserve transfer bill, which was defeated on Tuesday, June 10. These gentlemen, when their measure had an excellent chance of passing, were found "asleep at the switch."

The passage of an irrigation bill has long been needed. The country is to be congratulated on the fact that the measure has been enacted at this session of Congress. The full text of the Irrigation Bill is printed in this number.

**The Summer Meeting.** Announcement was made in the April number of FORESTRY AND IRRIGATION that the summer meeting of the American Forestry Association will be held this year at Lansing, Michigan. The dates of the sessions have now been decided upon, namely, Wednesday and Thursday, August 27 and 28. At the close of the afternoon session of Thursday, August 28, members of the association who desire to attend the excursion will take a special train for Saginaw. From this point the excursion will proceed to the Michigan Forest Preserve, in Roscommon County. After an inspection of this preserve, the excursion party will be conveyed to Grayling for an inspection of the large lumber mills at that place. From there the journey will be continued to the hard-wood forests in Antrim County, thence to Mackinac.

At that point the party will disperse, the option being given to the individual members to return home by way of Lansing, or by lake steamers to Duluth, Detroit, Toledo, Erie, or Buffalo. A circular of information will be sent out in a few weeks to all members of the association, outlining in detail the plans for the meeting and subsequent excursion.

**New Kind of Railroad Spike.** An interesting experiment is being tried in Europe in the use of hardwood spikes, or spike plugs, on several railways in France to increase the holding power of ordinary screw spikes when driven in ties of Baltic Pine and other soft woods. Holes about one and three-eighths inches in diameter are

bored in the tie and tapped to receive screws of hardwood one and three-eighths inches in diameter at the bottom and two inches at the top, each with an iron band to prevent splitting. The wooden screws are hollow, and the iron spikes or screw spikes are driven into them. The increase in holding power is said to be from 30 to 40 per cent for the new pine ties, while in old ties it is from 33 per cent for beech to 62 per cent for oak and 80 per cent for pine.

**Tree Planting in New England.** A great interest is being shown in the planting of White Pine in New England. Many private owners and several corporations have this year planted a larger number of either White Pine in pure stand or in mixture with Hard Maple.

Mr. R. W. G. Welling, at Pajac Point farm, East Greenwich, R. I., has planted on very poor sandy soil about thirty acres of forest trees, a portion of the tract being wind-blown sand. Mr. Welling plans to extend year by year the area already planted. At Winchester, N. H., and at Wolfboro, N. H., a large amount of planting is planned. The citizens are beginning to renovate their waste pastures and birch-grown woodlands by planting it with small white-pine seedlings.

Mr. A. G. Moody, manager of the Moody schools at Northfield, Mass., and at Mt. Hermon, Mass., contemplates forest planting on their extensive grounds. Large planting operations are being carried on about the great Wachusett reservoir, near Clinton, Mass. The planting is here under the direct charge of Mr. T. F. Borst, a graduate of the New York State College of Forestry.

The foregoing forest plantings are a few of those for which plans have been made by the Bureau of Forestry.

**Forest Reserve Transfer Bill.** The bill to transfer the administration of the United States forest reserves from the Interior Department to the Department of Agriculture was defeated in the House on Tuesday, June 10. This action was unexpected, especially for such a reason as really brought about the adverse vote.

The transfer of the reserves was recommended by the Secretary of the Interior, in whose department the reserves now are; by the Secretary of Agriculture, and by President Roosevelt, who came out strongly in his first message to Congress favoring the move. The strongest argument in favor of the proposed transfer has been that it would bring about a much needed improvement in the administration of the reserves at a less cost than at present.

In the face of these recommendations the bill was defeated for the ostensible reason that "it would increase the expense of caring for the reserves." This was the point raised by Representative Cannon, Chairman of the House Committee on Appropriations, who headed the opposition to the bill. It is this same gentleman who, at each session of Congress, saves the nation from bankruptcy.

How thoroughly the nation has been saved in this instance is well illustrated by quoting the President's utterance on this subject:

"At present the protection of the forest reserves rests with the General Land Office, the mapping and description of their timber with the United States Geological Survey, and the preparation of plans for their conservative use with the Bureau of Forestry, which is also charged with the general advancement of practical forestry in the United States. These various functions should be united in the Bureau of Forestry, to which they properly belong. The present diffusion of responsibility is bad from every standpoint. It prevents that effective coöperation between the government and the men who utilize the resources of the reserves without which the interests of both must suffer. The scientific bureaus generally should be put under the Department of Agriculture. The President should have by law the power of transferring lands for use as forest reserves to the Department of Agriculture. He already has such power in the case of lands needed by the Departments of War and the Navy."

THE BLACK SECTIONS IN THIS MAP SHOW THE IRRIGATED LANDS OF CALIFORNIA. THE IRRIGATED AREA IN THIS STATE HAS INCREASED 44 PER CENT DURING THE TEN YEARS ENDING WITH 1899.

The defeat of this bill, especially on such a flimsy pretext as the appropriation bugaboo, is unreasonable. However, it merely delays action that is bound to come. The best interests of the national forest reserves demand this transfer, and all persons acquainted with the merits of the question are of one opinion in the matter.

**Enforcement of Forest Laws.** Up in Pennsylvania they object to people stealing timber from the state lands, and also to starting forest fires. The vigorous action of the Forest Commission seems to be spreading to the courts, as the following examples, reprinted from *Forest Leaves*, will show:

"In the March term of court in Pike County, suit was brought by the state against Hiram Miller and Jerry Labar for cutting timber on state lands. The parties were not tried; the district attorney was allowed to enter a *nolle prosequi* on payment of costs and a penalty of $75 by the defendants. Mr. Miller also gave written agreement to keep off of and to protect, so far as possible, state lands for a period of two years. It was also agreed that if he failed in any part of this understanding other suits would be brought against him. Altogether, the failure to recognize which side of the line the defendants were on cost them about $170."

The following is also quoted from *Forest Leaves:*

"The two parties indicted under act of 1879, in Union County, for setting fire to the woods, pleaded guilty and asked for the mercy of the court. They were sentenced to pay a fine of $50 each and costs of prosecution, or stand committed. They complied with the sentence."

From the Jefferson City, Mo., *Tribune* it is learned that "on May 24 Deputy U. S. Marshal Thos. McKenna arrived from Camden County with four tie choppers, charged with cutting timber on government lands. They are Wm. Peoples, Wm. Blaine, David J. Kelsey, and Charles Kelsey. They waived a preliminary hearing before U. S. Commissioner Grisberg, and were held for the federal grand jury in the sum of $200 each."

Even the business of persons who steal timber from the federal or state government lands is becoming risky. In many sections of the country there is a feeling that stealing from the government is not actually a crime. Prompt enforcement of existing laws, such as the cases cited above, will rapidly dissipate this idea. Timber stealing has been a big business for years in many sections of the country, the government generally being the victim, but with the rapid increase of interest in our forests there is a tendency to treat it in its proper light—as plain stealing. The support of every good citizen should be given the officers in their attempts to break up this nefarious business.

**Appropriations for Forestry and Irrigation.** The agricultural appropriation bill, which was passed by Congress the last week in May, contains increased appropriations for both forestry and irrigation. The appropriation for the Bureau of Forestry is $291,860. The amount last year was $185,440. This bill also contains an appropriation of $65,000 to continue the irrigation investigations of the Department of Agriculture. The good roads investigation comes in for an appropriation of $30,000.

**Civil Service Examination.** The result of the recent civil service examination to fill the position of computer in the Bureau of Forestry, as announced by the Civil Service Commission, shows that the successful candidates were John Foley, Carl G. Crawford, and Harry D. Tieman. Crawford and Tieman have received appointments in the Bureau, while Foley has for some time been a member of that organization.

**Working Plan for the Kirby Tract.** The application of the Kirby Lumber Company and Houston Oil Company to the Bureau of Forestry for advice and assistance in the handling of their forest lands has

resulted in a request by these companies for a working plan for their entire holdings, amounting to more than 1,000,000 acres. This request for a working plan was made after a preliminary examination of the tract by Mr. Overton W. Price and Mr. T. H. Sherrard, of the Bureau of Forestry.

This work by the Bureau will begin on November 1, and be continued through the winter months by a force of thirty men, and will undoubtedly prove one of the most interesting pieces of forest work yet undertaken in this country.

The following facts concerning this tract are taken from the preliminary report of the Bureau of Forestry:

The forest lands of the Kirby Lumber Company and the Houston Oil Company lie in Jaspar, Sabine, Hardin, St. Augustine, Newton, Angeline, and Tyler Counties, southeastern Texas. They comprise an area of approximately 1,250,000 acres. They include practically all of the more valuable virgin Longleaf Pine land in these counties.

Although not a continuous holding, these forest lands have been purchased with a view to facilitate lumbering. They occur more in well-defined blocks than in isolated areas of small extent. Except for the narrow band of clearings which encircle the towns, and for the small farms here and there, seldom exceeding 160 acres, the forest is unbroken.

About 12,000 cattle are now grazing upon these forest lands. The largest holder has about 2,000 head. This is an exceptionally large herd, the number varying usually from 150 to 300.

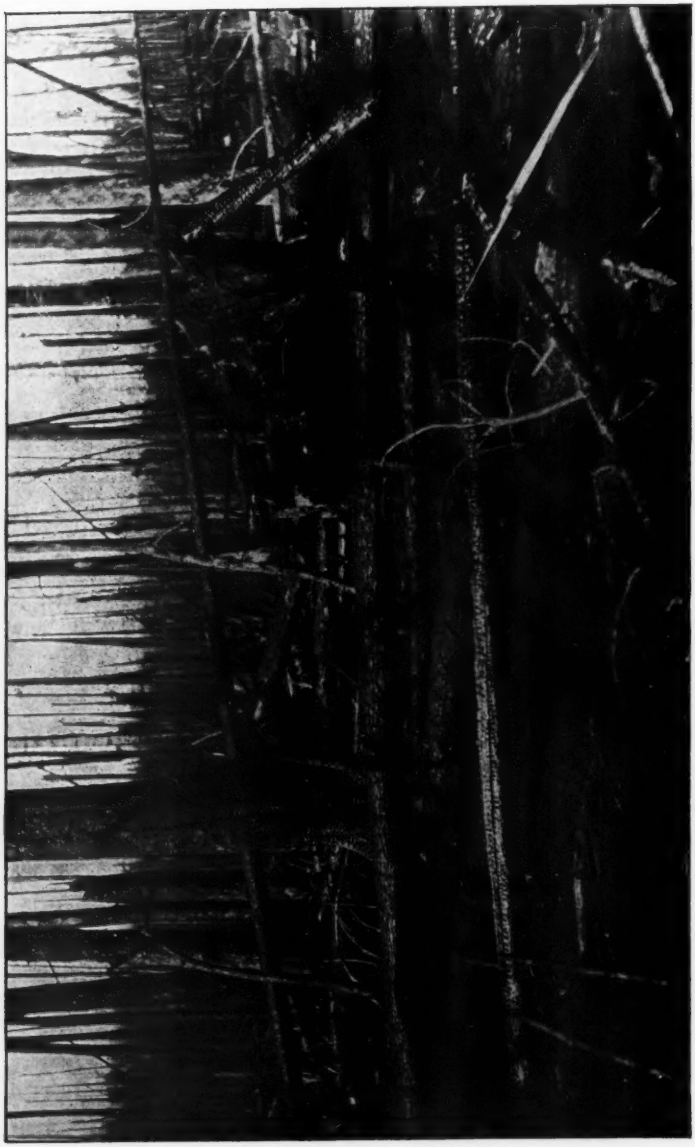
Cuttings are now in progress at the rate of about 250,000,000 feet yearly. The intention is to increase this cut to 400,000,000 feet per annum southwest of Kirbyville. The company is now filling a contract for 7,000,000 cross-ties with the Santa Fé Railroad Company. The ties are cut from lands which have been or are about to be lumbered for saw-logs.

The merchantable stand upon the virgin forest lands of the Kirby Lumber Company and the Houston Oil Company has been conservatively estimated to average 5,000 feet, b. m., to the acre. The presence of underbrush, the flatness of the country, and the lack of swamp and soft ground generally, constitute exceedingly favorable conditions for clean lumbering. The use of temporary railroads and steam skidder greatly reduce the cost of logging. The problem of labor is simplified by the presence of a permanent population who depend largely upon lumbering and upon work in the saw-mills for their livelihood. The Kirby Lumber Company, with its 17 mills and its annual cut of 250,000,000 feet, is the chief source of support of about 15,000 people. It is probable that the low proportion upon these forest lands of the cost of lumbering to the value of its product is equalled in the Southern Pine Belt in very few localities only.

The forest lands of the Kirby Lumber Company and the Houston Oil Company offer what is in a good many ways a singularly simple and direct silvicultural problem. The tract consists largely of pure stands of Longleaf Pine whose reproduction is, with reasonable protection, insured. Even under the present lack of provision for reproduction upon the lumbered area and with the entire absence of effect to suppress the annual fires, openings in the forest show a growth of seedlings in some instances sufficient to form the nucleus of a second crop.

**More Forest Reserves.** The Big Horn Forest Reserve, in Wyoming, was increased in size 69,120 acres on May 22 by Presidential proclamation. The recently added portion is located in Sheridan county. The total area of this reserve is now 1,216,960 acres.

On the same date the Yellowstone Park Forest Reserve was also created. This new reserve includes a portion of what was formerly known as the Yellowstone Park Timber Land Reserve, and in addition 880,533 acres of the new land. The total area of the Yellowstone Reserve is 1,809,280 acres. It is located in the western part of Big Horn County bordering the Yellowstone National Park.



A FOREST ENTIRELY DESTROYED BY FIRE. MUCH OF THE DEAD TIMBER THROWN DOWN BY THE WIND.

The Teton Forest Reserve has been considerably enlarged by taking in a portion of the Yellowstone Park Timber Land Reserve and new lands to the amount of 2,987,627 acres, making its present area 4,127,360 acres, the second largest reserve in the West. The Teton Reserve is located in the northwest part of Fremont County and the northern part of Uintah County, Wyoming.

Another new reserve declared on May 22, also in Wyoming, is the Medicine Bow Forest Reserve, of 400,051 acres, located in Carbon and Albany Counties. The total area of all the forest reserves is now 52,339,432 acres.

**Forestry in Pennsylvania.** At the meeting of the Pennsylvania State Forestry Reservation Commission, held on May 1, a tract of land situate in Union, Center, Mifflin, and Snyder Counties, containing about 74,000 acres, was purchased for the state. About 6,000 acres were also purchased in Huntingdon County, and a tract of 500 acres in Pike County. Acting under instructions from the Commission, State Forester Geo. H. Wirt has established a nursery at Mount Alto, Franklin County, on which there are growing 15,000 young white pine trees, and seed has been sown for 300,000 more. An ideal spot of land has been selected for the nursery. Water will be piped so as to reach all points of the nursery when necessary. Arrangements are being made now to plant half a million young pine trees next spring and 50,000 poplars. There is also a spontaneous growth of white pine on the tract, about twenty years old, which will afford a splendid opportunity for the exercise of the forester's art. It will show what can be done by pruning and selective cutting.

The opening of this nursery on the Mount Alto Reservation has its uses also as an object lesson, and has awakened the greatest interest on the part of the citizens of the neighborhood, who have lent a ready assistance to the operator when it was in their power to do so. It looks like a revival of the old-time industry which prevailed when Mount Alto was a thriving furnace seat.—*Forest Leaves.*

**Forest Fires During May.** During the month of May there were forest fires in fourteen states, as follows: Maine, Massachusetts, New York, Colorado, Connecticut, New Jersey, Michigan, North Carolina, Texas, Tennessee, Maryland, Arizona, Pennsylvania, and Rhode Island.

The most destructive fires of the month were in Maine, Colorado, and New York. A large amount of timber in the Adirondacks, belonging to private owners, was damaged. A number of forest fires near East Moriches, L. I., early in the month, required the efforts of hundreds of people to prevent the destruction of dwellings and other buildings.

Late in the month a forest fire raged in the Sangre de Cristo Mountains, in Colorado. Great damage to standing timber was caused by the fire, while the water supply and grazing grounds of the vicinity have been materially injured.

In New Brunswick and British Columbia there were many forest fires which destroyed much standing timber.

## THE IRRIGATION BILL.

THE bill providing for the creation of a reclamation fund, and for the construction of reservoirs, diversion canals, and other works, passed the Senate March 1, and was sent to the House, where it was referred to the Committee on Irrigation of Arid Lands. Various amendments were made in committee, the bill being improved in detail. On April 7 it was reported to the House of Representatives.

The principal features are the setting aside of the proceeds from disposal of western arid lands to form a fund, by means of which the Secretary of the Interior can make surveys and examinations and proceed with the construction of necessary works for water conserva-

tion. It is not proposed to actually irrigate the lands, but to build the large works which will serve to make available the waters now running to waste.

The public lands to which the water thus conserved can be taken are to be withdrawn from disposal, excepting under the Homestead act. Settlers can go upon these, taking up tracts of 40 acres or more and make homes, the land itself being free to those who will permanently reside upon it. The water, however, must be paid for, and the settlers must construct their own works for distributing the supply to the fields.

The money refunded by the settlers in small annual installments goes back into the reclamation fund, and is to be used again for the construction of other works.

The principal objection to the bill has arisen upon the ground of constitutionality, it being held that the government could not improve its own lands, or exercise the privileges of a land-owner in removing obstacles to development. There has also been some opposition on the part of the farmers' organization known as the Grange, from the fear that with the increase of tillable area in the West, farm values in the East would be reduced. This fear has been shown to be groundless, since the development of the arid region must proceed far more slowly than the demands for land The agricultural products of the West differ widely from those of the East, and staple crops are not raised to any considerable extent under irrigation, and do not enter the same markets as those of the East. In short, the opposition from this source has been based wholly upon ignorance of the true condition.

With the passage of this act it will be possible to proceed in a systematic manner in the construction of large works, to reclaim arid lands and create opportunities for home-making upon the public domain. The benefits must be far-reaching, affecting not only the states where the lands are irrigated, but increasing the commerce with the East, and stimulating industry along many lines.

The full text of the bill, as amended, is given herewith :

AN ACT appropriating the receipts from the sale and disposal of public lands in certain states and territories to the construction of irrigation works for the reclamation of arid lands.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all moneys received from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming, beginning with the fiscal year ending June thirtieth, nineteen hundred and one, including the surplus of fees and commissions in excess of allowances to registers and receivers, and excepting the five per centum of the proceeds of the sales of public lands in the above states set aside by law for educational and other purposes, shall be, and the same are hereby, reserved, set aside, and appropriated as a special fund in the Treasury to be known as the "reclamation fund," to be used in the examination and survey for and the construction and maintenance of irrigation works for the storage, diversion, and development of waters for the reclamation of arid and semi-arid lands in the said states and territories, and for the payment of all other expenditures provided for in this act : Provided, That in case the receipts from the sale and disposal of public lands other than those realized from the sale and disposal of lands referred to in this section are insufficient to meet the requirements for the support of agricultural colleges in the several states and territories, under the act of August thirtieth, eighteen hundred and ninety, entitled "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts, established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two," the deficiency, if any, in the sum necessary for the support of the said colleges shall be provided for from any moneys in the Treasury not otherwise appropriated.

SEC. 2. That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion, and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, giving estimates of cost of all contemplated works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction as well as of those which have been completed.

SEC. 3. That the Secretary of the Interior shall, before giving the public notice provided for in section four of this act, withdraw from public entry the lands required for any irrigation works contemplated under the provisions of this act, and shall restore to public entry any of the lands so withdrawn when, in his judgment, such lands are not required for the purposes of this act; and the Secretary of the Interior is hereby authorized, at or immediately prior to the time of beginning the surveys for any contemplated irrigation works, to withdraw from entry, except under the homestead laws, any public lands believed to be susceptible of irrigation from said works: Provided, That all lands entered and entries made under the homestead laws within area so withdrawn during such withdrawal shall be subject to all the provisions, limitations, charges, terms, and conditions of this act; that said surveys shall be prosecuted diligently to completion, and upon the completion thereof, and of the necessary maps, plans, and estimates of cost, the Secretary of the Interior shall determine whether or not said project is practicable and advisable, and if determined to be impracticable or unadvisable he shall thereupon restore said lands to entry; that public lands which it is proposed to irrigate by means of any contemplated works shall be subject to entry only under the provisions of the homestead laws in tracts of not less than forty nor more than one hundred and sixty acres, and shall be subject to the limitations, charges, terms, and conditions herein provided: Provided, That the commutation provisions of the homestead laws shall not apply to entries made under this act.

SEC. 4. That upon the determination by the Secretary of the Interior that any irrigation project is practicable, he may cause to be let contracts for the construction of the same, in whole or in part, providing the necessary funds therefor are available in the reclamation fund, and thereupon he shall give public notice of the lands irrigable under such project, and limit of area per entry, which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question; also of the charges which shall be made per acre upon the said entries, and upon lands in private ownership which may be irrigated by the waters of the said irrigation project, and the number of annual installments, not exceeding ten, in which such charges shall be paid and the time when such payments shall commence. The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project, and shall be apportioned equitably: Provided, That in all construction work eight hours shall constitute a day's work, and no Mongolian labor shall be employed thereon.

SEC. 5. That the entryman upon lands to be irrigated by such works shall, in addition to compliance with the homestead laws, reclaim at least one-half of the total irrigable area of his entry for agricultural purposes, and before receiving patent for the lands covered by his entry shall pay to the government the charges apportioned against such tract, as provided in section four. No right to the use of water for land in private ownership shall be sold for a tract exceeding one hundred and sixty acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual *bona fide* resident on such land, or occupant thereof residing in the neighborhood of said land, and

no such right shall permanently attach until all payments therefor are made. The annual installments shall be paid to the receiver of the local land office of the district in which the land is situated, and a failure to make any two payments when due shall render the entry subject to cancellation, with the forfeiture of all rights under this act, as well as of any moneys already paid thereon. All moneys received from the above sources shall be paid into the reclamation fund. Registers and receivers shall be allowed the usual commissions on all moneys paid for lands entered under this act.

SEC. 6. That the Secretary of the Interior is hereby authorized and directed to use the reclamation fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provisions of this act: Provided, That when the payments required by this act are made for the major portion of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense under such form of organization and under such rules and regulations as may be acceptable to the Secretary of the Interior: Provided, That the title to and the management and operation of the reservoirs and the works necessary for their protection and operation shall remain in the government until otherwise provided by Congress.

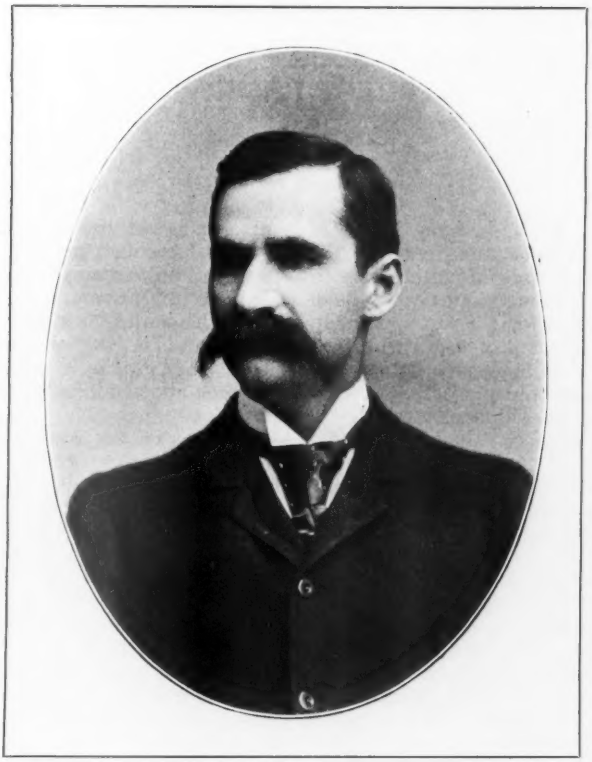
SEC. 7. That where in carrying out the provisions of this act it becomes necessary to acquire any rights or property, the Secretary of the Interior is hereby authorized to acquire the same for the United States by purchase or by condemnation under judicial process, and to pay from the reclamation fund the sums which may be needed for that purpose, and it shall be the duty of the Attorney General of the United States upon every application of the Secretary of the Interior, under this act, to cause proceedings to be commenced for condemnation within thirty days from the receipt of the application at the Department of Justice.

SEC. 8. That nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any state or territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any state or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof: Provided, That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.

SEC. 9. That it is hereby declared to be the duty of the Secretary of the Interior in carrying out the provisions of this act, so far as the same may be practicable and subject to the existence of feasible irrigation projects, to expend the major portion of the funds arising from the sale of public lands within each state and territory hereinbefore named for the benefit of arid and semi-arid lands within the limits of such state or territory: Provided, That the Secretary may temporarily use such portion of said funds for the benefit of arid or semi-arid lands in any particular state or territory hereinbefore named as he may deem advisable, when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately, and in any event, within each ten-year period after the passage of this act, the expenditures for the benefit of the said states and territories shall be equalized according to the proportions and subject to the conditions as to practicability and feasibility aforesaid.

SEC. 10. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect.

Passed the Senate March 1, 1902.



HON. H. C. HANSBROUGH.

SENATOR HANSBROUGH has been one of the most active and efficient advocates of the development of the West through irrigation. By his long experience in the far West he has become thoroughly familiar with the opportunities and results of irrigation, and has come to be regarded as the most strenuous advocate in the Senate of the utilization of the vacant public lands through national irrigation works. His position as Chairman of the Senate Committee on Public Lands, and also as a member of the Committee on Agriculture and Forestry, has given him exceptional opportunities for advancing the interests of the West in Congress, and his name will always be connected with the irrigation movement because of the introduction by him of the first bill (which has passed the Senate) providing for the construction of national irrigation works.

Henry Clay Hansbrough was born at Prairie du Rocher, Randolph County, Illinois, January 30, 1848. He was educated in a common school, and in 1867 removed to California, where he learned the printing trade; later published a daily paper at San José, California. He was with the San Francisco *Chronicle* from 1870 to 1879; then published a paper at Baraboo, Wisconsin, for two years, removing to the Territory of Dakota in 1882, and became prominent in journalism and in public affairs, being twice elected mayor of the city of Devil's Lake; was National Committeeman for eight years; was nominated for Congress by the first Republican State Convention in North Dakota, and before the expiration of his term in the House was elected to the United States Senate, in 1891, and reëlected in 1897.

# GRAZING AND WATER STORAGE IN THE BLACK MESA FOREST RESERVE.

By A. F. Potter,
Bureau of Forestry.

THE live-stock industry is one of great importance to all of the states of the Rocky Mountain region, many sections being almost entirely dependent upon it for their support. In the early settlement of this part of the frontier the mining prospectors and stockmen were the pioneers. A very large proportion of this western country will always be more valuable for stock-raising than for any other purpose, the land which can be cultivated comprising a very small part of the entire area.

The crop of forage which grows upon this open range is one of the country's most valuable resources and can be harvested only by grazing. Many sections are divided naturally into summer and winter ranges, the utilization of one depending greatly upon the other. A summer range, which is covered with snow during the winter and furnishes an excellent crop of forage during the summer, would be of little use without an adjoining winter range. It sometimes happens that the winter range is one upon which permanent water is very scarce, and is grazed over during the winter only while there is snow upon the ground or the winter storms have made tank or lake water. When this dries up in the spring the stock move back to the permanent watering places and to the mountains. In many places without the mountain summer range this kind of winter range would be of little value.

As forest reserves are established and these mountain ranges put under forest-reserve management, the rules and regulations which are to be enforced are of great importance to the stockmen. The present rules for grazing in forest reserves prohibit the grazing of sheep in all forest reserves except those of Oregon and Washington, or in the reserves where their presence would not adversely affect insuring a permanent supply of timber and favorable conditions to a continuous water flow. The Black Mesa Forest Reserve, in Arizona, is one in which a limited number of sheep have been allowed to graze since its establishment. The grazing of cattle and horses has been allowed in all of the forest reserves.

The reason for restricting sheep is that there is greater evidence of damage having been done by them than by cattle and horses. In moving sheep from place to place, especially in driving along trails from one range to another, if the flocks are bunched up close, and thus driven instead of being allowed to scatter out and graze along naturally, they do more damage in tramping out young seedlings and grass roots than is done by stock which are allowed to run loose; also, on lambing grounds, where flocks are bedded or corralled for several weeks in the same place, there is often evidence of considerable damage to young trees by nibbling; consequently the greatest damage from tramping is generally seen along the driveways, and the damage from nibbling in places where flocks have been held too long.

The manner of handling sheep is of importance in judging the number which can safely be allowed to graze upon a certain area, as 5,000 head improperly herded would do more damage than double the number which were allowed to scatter out and graze properly.

In some limited areas which have been overstocked with cattle serious damage has been done by stock running loose, both in the destruction of young trees and tramping out the grass.

The remedy for these evils is to limit the sheep, cattle, or horses which shall be grazed upon a certain area to a number for which that particular section

will furnish sufficient pasture without danger to reforestation or the forage crop, and to hold the stockmen responsible for the proper use of the range. In some parts of the reserve total exclusion of live stock may be necessary, but in most places all that is needed is proper regulation and coöperation on the part of the stockmen and settlers in preventing forest fires. Fire has been the greatest enemy to reproduction in this reserve, as in many others.

The first sheep were driven into Arizona about 1875, coming across the desert from California. These flocks were followed by others in later years, and also by bands from New Mexico. Ever since those early days the mountain ranges have been used by the sheepmen for lambing grounds and summer range. The splendid reproduction of young trees in many parts of the forest reserve which have been constantly grazed over for the past twenty-five years shows that here, at least, the harvesting of the crop of grass has been done without damage to the forest, and has evidently protected the young trees by causing forest fires to be less destructive.

Sheep need shade and a cool temperature during the summer. Not only do they keep in better flesh, but the fleece of wool makes a better growth and is improved in quality.

In order to raise a good, thrifty lamb, it is necessary that you have green feed for the ewes, so that they will furnish plenty of milk. With dry feed and a consequent scarcity of milk, you are sure to raise a "runty" lot of lambs. It is necessary that a lamb should make a good healthy growth during the first month of its life, if you expect to raise a profitable sheep. As the earliest green grass and herbage is found along the foot of the mountains, and later, after the snow has disappeared, in the mountain parks, this is the natural breeding ground to which they are driven from the winter range. Most of these summer ranges and lambing grounds being located within the limits of the forest reserve, this industry would be seriously

A SECTION WHICH HAS BEEN SERIOUSLY INJURED BY SHEEP AND CATTLE.

injured if sheep were excluded from the reserve.

For the past fifteen years some of the sheep-owners have driven their bands to the Salt River Valley during the winter months. This winter range was desirable, because in this mild climate the ewes could be lambed fully two months earlier than on the northern ranges, and the sheep fattened rapidly on the feed furnished by these ranges of lower altitude. Particularly was this true in seasons of copious rainfall, when the desert valleys were covered with a prolific growth of Indian Wheat and Alfileria, the fattening qualities of which cannot be excelled by any other range forage plants. The largely increased number of sheep driven to these southern ranges each year caused a strong opposition to arise among the cattlemen over whose ranges they passed in transit, as it very materially decreased the carrying capacity of the range for cattle.

In August, 1898, the mountain range extending across the northeastern part of Arizona was set apart by the President as the San Francisco Mountains and Black Mesa Forest Reserves. The rules and regulations prohibited the grazing of sheep within the reserves. Consequently the sheepmen whose interests were at stake took steps toward securing the granting of the grazing privilege. Now commenced a vigorous opposition from the canal-owners and farmers of the Salt River Valley, who claimed that the grazing of sheep in the mountains diminished their water supply and filled their canals with silt; from the cattlemen, whose ranges had been injured, and from the owners of the railroad lands, who had various objects in view. The result was that, after investigation of the question and examination of the forest reserves, the sheepmen were granted permits to graze their flocks on the north slope of the

EXCELLENT REPRODUCTION ON A RANGE WHICH HAS BEEN GRAZED BY SHEEP AND CATTLE FOR TWENTY-FIVE YEARS.

REPRODUCTION EXTENDING FROM THE EDGE OF THE FOREST ON AN OLD SHEEP RANGE.

mountains and some of the level mesas and excluded from the rough southern slopes.

The Black Mesa Forest Reserve is one in which the object in view in its establishment was as much for the purpose of securing favorable conditions of water flow as for the protection of the timber. The location of the reserve being away from the railroad or any means of cheap transportation, it will probably be some time before there will be any extensive lumbering carried on within its limits. The only cutting which has been done so far was either for local use by the settlers near the reserve or for the mines at Clifton and Morenci. On the other hand, the conservation of the water is of immediate and vital importance.

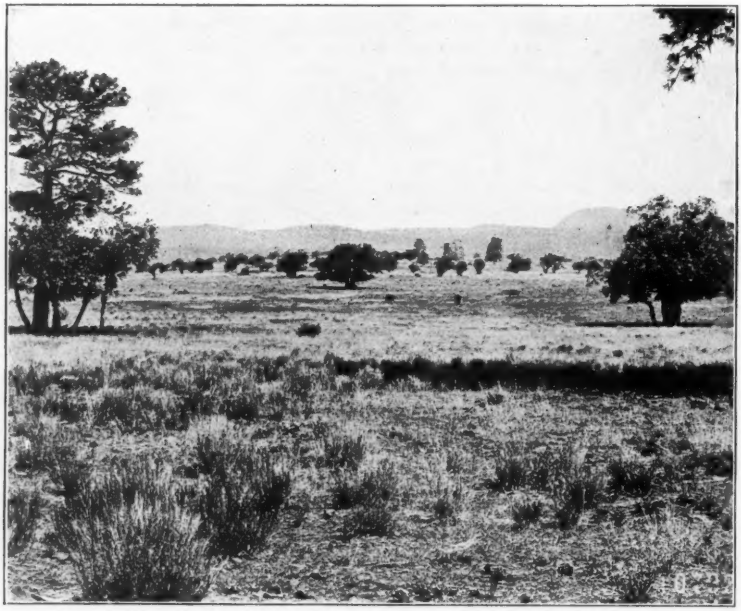
The future development of agriculture in Arizona depends entirely upon a successful plan for storing the water supply. The rainfall varies greatly with each season, and is much heavier in the mountains than in the lower valleys. From observations covering a number of years, the normal rainfall of the Salt River Valley is placed at 7 inches, while at Camp Apache, on the south slope of the mountains and in the edge of the timber belt, the average rainfall is 20 inches. The general character of the mountain range being volcanic, a large proportion of the water from the snow which falls during the winter is absorbed and seldom causes floods of any consequence during this season, except when in the early spring snow is followed by rains or warm winds. As the amount of new land which can be brought under cultivation depends entirely upon success in saving the water, it is important that every condition which affects it should be investigated.

In the controversy between the citizens of Maricopa county and those of the northern counties over the question of grazing in the forest reserves, it has been claimed that the canals of the Salt River Valley were being filled with silt and débris, and that this was caused by the cutting away of vast areas of timber

on the forest reserves and by the grazing of large flocks of sheep and herds of cattle and horses over the drainage basins. This would lead one to believe that if the timber cutting were stopped and the sheep, cattle, and horses excluded from the forest reserve, an ideal condition could be obtained and the quantity of silt and débris carried in the water would be sufficiently diminished to obviate the danger of filling the canals.

It is doubtful if this would be so for two reasons: first, because a very small proportion of the silt comes from the forest reserves, and, second, that the flood waters coming from outside of the reserve carried a large amount of silt before the country was stocked with cattle and sheep. That the amount of silt coming into their canals during the last few years is greater than it was previously is true, and the cause of this condition is the serious damage that has been done to the open range outside of the mountains by overstocking with cattle, horses, and sheep, and also the number of dry years from which the country has suffered. Until some system or plan has been devised for controlling grazing upon the open range which will benefit the stockmen by improving its condition and permanent wealth-producing capacity, as well as protecting the irrigation interests, this condition regarding the flood waters can not be very greatly remedied.

In the early years of the live-stock industry in northern Arizona, while the country was new and had not been injured by overgrazing, the summer rains were generally thunder showers, coming up suddenly and just falling in spots, or from a cloud-burst, with the water falling in torrents over an area of a few square miles. A dry wash would in a very short time become a running stream, which would swim your horse if you undertook to cross it. These storms always caused floods in the river, and the water carried a large amount of silt, one remarkable feature being that you could often tell from the color of the muddy water and the quantity of silt it



CATTLE RANGE WITHIN THE FOREST RESERVE ON THE SLOPE OF THE VERDE RIVER.

contained what part of the country had been having the heavy rain, the flood waters from the Zuñi River carrying the largest amount of silt, while from the volcanic mountain country the per cent of silt would be small.

Where reservoirs are located near the mountains and catch the mountain flood waters, there is a very small deposit of silt and débris. For example, in the reservoirs near Springerville, which are within or near the forest reserve and catch the mountain flood waters, the deposit of silt during the past fifteen years has been very little, while at Woodruff, a town located on the Little Colorado River, about fifty miles from the mountains and below its confluence with the streams from the open range country, a dam forty feet high was built across the river where it flows through a box canyon, and the reservoir above the dam entirely filled with mud in about ten years. As these people were only figuring on securing the natural flow of the river by getting it out of the canyon and did not expect the dam to be of any value as a storage reservoir, their object was accomplished.

Quite a number of small storage reservoirs have been built in northern Arizona from which some good lessons might be taken. The most valuable reservoirs are those built in coves off to one side of the river, and which are filled during the winter and early spring, when the water is running clear and quite free from silt. If reservoirs could be built of sufficient capacity to store all of this water, the area of agricultural lands could be greatly increased without the flood waters. When the flood waters come down heavily laden with silt the flood-gates are opened and the muddy water allowed to pass on by. Reservoirs which have been used in this way for the past fifteen years are in good condition and have accumulated very little sediment. If it happens to be late in the season, in a time when the water is greatly needed, it is turned directly into the ditches instead of the storage reservoir and distributed over the land. It may fill up the ditches a little, but it makes up for this by fertilizing the land.

The heavy rainfall and source of permanent water supply being in the mountains, the importance of the forest reserve as the foundation of a successful irrigation system is very readily seen; consequently every precaution should be taken for its protection. Investigation having shown that serious damage has not been done in this forest reserve by grazing, and the prosperity of several of the adjoining counties depending greatly upon the live-stock industry, it is evident that what is needed here is a system of regulation which will insure to the government and the irrigation interests that the forest conditions will be maintained and improved, and to the stockman that if he obeys the regulations and continues to use the range judiciously he will be allowed the grazing privilege. If the plans for the regulation of grazing prove to be practical and the forage crop is thus utilized without injury to the timber or water supply, the result will be an increased sentiment in favor of the forest reserves and a great benefit to the commonwealth.

## ADMINISTRATION OF U. S. FOREST RESERVES.

By Filibert Roth,

Chief of Division R, General Land Office.

### PART II.—CHANGES OF THE LAST YEAR.

As stated in the last issue of this paper, the work of caring for the National Forest Reserves is still in its infancy, having barely finished its fourth year. The work was organized under temporary, makeshift conditions, with a vast and constantly increasing field of action and new conditions to be met and

new obstacles to overcome at every step. To some extent this unsettled condition still exists. New reserves are being created; the limits of old reserves are modified. Settlements are springing up along the boundaries of different reserves, and great mining developments, with their accessories of roads, railroads, towns, etc., are rapidly complicating the affairs of the reserves.

Nevertheless, the experience of the first three years had sufficiently demonstrated the need of a number of changes, so that in November, 1901, the Secretary of the Interior, in an "Outline of Principles and Practice to Govern the National Forest Reserves," approved a plan modifying the former practice. The following are some of the principal changes directed in the above outline and so far accomplished:

The position of the superintendent has been modified, so that his duties are practically those of a local inspector. This change became necessary for two principal reasons. In the past the superintendent was burdened with so much routine office work that it was impossible for him to take the field and fully attend to his most important function, namely, that of inspection and direction. Besides this, the transmission of all papers through the office of the superintendent added greatly to the delay of important business. An application for timber, frequently delayed for a few weeks at the supervisor's, owing to distant field duty, would be further delayed by absence from office of the superintendent or by necessity, real or imaginary, of referring the application back to the supervisor and from him, in turn, to the ranger. In this way most vexatious delays occurred, sometimes doing serious and lasting damage to important mining concerns, or hindering materially worthy settlers in their efforts to improve their lands.

The position of the supervisor has been modified in the direction of giving to it more power and permanence, and also by increasing its duties and responsibilities. Instead of receiving all orders and transmitting all reports through the superintendent, the supervisor now receives his orders direct from the central office, originates orders and reports, and communicates directly with the central office at Washington. In addition, he is allowed greater freedom in handling his men, has the authority of granting the permits for the ordinary cases of "free use" of timber up to a stumpage value of $20, and grants grazing permits to all residents within the forest reserves where the amount of stock (only horses and cattle) does not exceed one hundred head. In short, he is the real manager of the reserve. Contrary to former practice, most of the supervisors are no longer paid by the day, nor are all supervisors paid the same salary ($5 per day and $1.50 per day in lieu of subsistence), but the different supervisors are paid more in accordance with the area of territory in their care and the amount of business transacted by them. On the other hand, it is the intention to continue their services throughout the year, irrespective of the location of their reserves.

In the past, for reasons of economy, nearly all supervisors of the northern reserves, including those of the northern part of California, in Oregon, Washington, Idaho, Montana, Wyoming, Colorado, and Utah, were dismissed in the fall of the year and reinstated, or new men employed, in the beginning of the summer of the following year. This has been one of the most discouraging features of the supervisor's position and has deterred many from ever offering their services. To the reserve this intermittent care was injurious. The absence of any supervisor encouraged trespass in timber and otherwise. The inability of doing business with the reserve on account of this absence of any manager in some instances urged otherwise honest people to a "help-yourself" method of satisfying their legitimate demands. In addition, the supervisor never had time and opportunity to really learn either his business or his reserve. Where a new man was appointed, as was frequently the case, he was obliged to learn everything anew. The agricultural settlements in and about his reserve, the mining and stock interests, everything was new, and, though investigated and reported on repeatedly,

he had hardly any other way of knowing them except by a repetition of their investigation. By the time he had learned the many conditions of his reserve it was time for his dismissal. In the planning of his work and in the handling of his men the same disadvantages appeared, even emphasized. The short period of service made the position undesirable, the uncertainty of reappointment discouraged the interest necessary to a careful study of conditions, and thus prevented that continuity of plan and method essential to an economic and yet efficient service. The rangers being dismissed at the same time with the supervisors, there was no certainty as to the amount, character, or preparation of the assistance furnished to the supervisor, and thus the handling of his men was seriously affected by this same interruption of the work.

Among the additions to their duties, the supervisors will be required to keep a well-planned, uniform record, on blank sheets furnished by the department, of all important affairs and conditions of their reserves, so that the successor of any supervisor or the inspecting officer can at any moment see from these records where the timber has been removed, what parts remain still uncut, and can readily find the number, location and other facts concerning every saw-mill, agricultural claim, or other establishment within the reserve.

In the ranger or working force the changes have been equally radical and far-reaching. There are now three classes of rangers, with salaries of $90, $75, and $60 per month, respectively. The positions of classes I ($90) and II ($75) are filled as far as possible by promotion, in which efficient service on the reserve, knowledge of the reserve and its conditions, and general education and experience—especially in woodsman's affairs—are all carefully considered. In a few of the reserves the cost of living and cost of maintenance of a satisfactory mount is also taken into consideration.

The need of better pay for rangers has been felt for some time. A ranger is obliged to keep at least two good horses. Often he should have three, and in addition he must keep his own camping outfit and supplies. He is supposed to know the rules and regulations of forest reserves, be a man of good sense, considerable experience, fair education and conduct, be on duty practically every day, and has considerable responsibility. This he does in a district where any able-bodied man, with ordinary labor during eight or ten hours per day, receives better pay without being required to camp out alone or spend his Sundays doing guard duty.

As to the rangers of class I and part of class II on most of the reserves, it may be said that they are expected to be well acquainted with timber work, understand scaling, estimating, and measuring of timber, be able to "cruise" and map a piece of woods, report intelligently on a piece of forest land or a wood contract, and thus fill the place of the ordinary estimator or "land-looker," who, with most of our lumber companies, draws a salary of usually $3 to $5 a day and everything furnished.

In the past the rangers shared the fate of the supervisors. They were engaged as the season advanced and the increased danger from fire appeared to require additional forces. In all reserves the majority of the rangers were laid off during winter. In a number of reserves the entire force was dismissed. While this method was probably the best under the circumstances, furnishing the largest number of men during the most dangerous season of each year, yet the uncertainty and irregularity of the service discouraged good men and made it impossible for supervisor and men to plan or organize their work in any satisfactory manner. By having a certain number of the men of classes I and II retained permanently on each reserve, the plan and work become continuous, and the temporary force, when put on in the spring, finds a controlling body properly equipped with the necessary knowledge of where to go and what to do, and with the interest of a permanent occupation, which alone is able to inspire and carry the lonely work of a mountain ranger to success.

In the distribution of the rangers it has been necessary in the past, and is yet, in the case of all new reserves, to

proceed in the manner of "try and try again." While this method was the only feasible one in the beginning, it left the matter without any coördination. Every forest officer, naturally and properly, considered his needs the greatest, and the officer who was able to present his needs in the most impressive way, often by reinforcement of popular petitions, obtained the largest share of assistance. In this way the distribution of the fiscal year 1900–1901 was rather badly balanced. Thus the expenses for an area of 3,900,000 acres in one state were about $80,000; for the same area in another state about $9,000; in still another, $14,000. To avoid this lack of coördination an attempt is made to distribute the forces according to the conditions requiring the service.

The principal conditions here under consideration are the area of the reserve; determining the effort to patrol the same; its location—*i. e.*, whether in Arizona, where danger from fire lasts for more than eight months, or whether in Montana, where five months cover the dangerous season. In addition, the business of the reserve is considered; the amount of timber sales, requiring survey estimates, patrol, and supervision; the number of cases of free use, each of which requires one or two days' work of a ranger; the amount of stock grazed within the reserve, and also the number of farming and mining settlements in and near the reserve, all tending to complicate the work, and therefore calling for additional help. In this way it is hoped to make a fairer distribution and give all reserves more nearly their share of the benefit of the protection provided by the government.

According to this general plan, based on present conditions, there would be employed for the coming year a field force composed of about:

20 rangers of class I.

90 rangers of class II,

180 rangers of class III for a period of five months per year, and

70 rangers of class III for a period of eight months per year.

In the employment of rangers a regular blank form of application is used in which the applicant makes full statement of his personal qualifications, his training, and experience. While it is a well-known fact that a paper application or examination is deficient and can never be relied upon alone, yet it is an equally well-known fact, and a fact upon which the present civil-service system is based, that such an examination is not only an excellent record of most of the necessary qualifications, but will prevent many, if not most, of the real objectionable applicants from entering the service.

In addition to the force employed in the past, it is intended to introduce a number of technically trained men, at present termed "head rangers." The function of these men, as at present conceived, is that of technical assistants to the supervisors. It is through these foresters that a correct and judicious interpretation of the instructions is to be accomplished, and it is through them that an application of the knowledge and methods of forestry is to be carried to the forest reserves. So far only two head rangers are in the service.

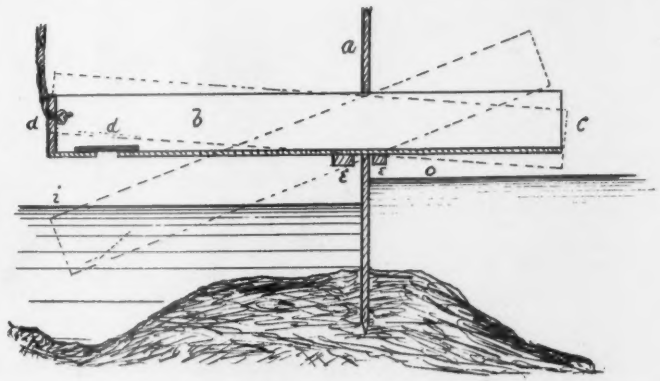
# A SIMPLE METHOD OF RAISING WATER.

By Major Gilbert Thompson,
U. S. Geological Survey

In 1871, while surveying along the Potomac River, at Washington, D. C., I noted a simple method of removing water from a place of excavation at the river's bank. The space was inclosed by a board piling, and at a point above the highest tide in the river a dipping trough was placed, by which the water had been removed from the excavation. This will be best understood by the accompanying sectional diagram: *a*, the board piling; *b*, the trough, which was made of pine boards nailed together and open at one end, *c*. It was kept in place by two cleats upon the under side where it rested in the piling. I think it was worked by an upright handle, similar to the "rockers" used by miners in placer mining, and probably a similar contrivance is used by them to remove water from trenches and excavations. I have added a flat valve and a lifting rope to give it a more general design. A brief examination of the diagram indicates that a number of arrangements can be designed to work it; a pulley with a counterpoise or lifting weight would be a practicable method.

There are a great number of purposes for which such a simple apparatus for lifting water a short distance would be very valuable. There is very often a pond, with good soil about it, which could be cultivated for garden purposes if water could be raised even one foot. Reservoirs can be frequently constructed in wet, marshy ground, affording a small but useful supply of water.

I have computed by graphic methods the following tables, which are accurate enough to be suggestive and of value in making an estimate of performance required. I have adopted a trough 10 feet in length from pivot point and 1 foot square, so the values can be easily adapted for other widths. It can be readily perceived that if the end which is submerged was made a bucket by fastening a board on the top, that more water could be raised at a single lift. I have accordingly computed such values for a bucket 1 foot, 2 feet, etc., in depth. How far this is entirely useful depends upon the fact that as the depth of submergence becomes greater the working becomes much slower. It may be re-




*a*, BOARD PILING; *b*, DIPPING TROUGH, OPEN AT *c*; *d*, CLOSED END AND LIFTING ROPE; *e e*, CLEATS TO HOLD TROUGH IN PLACE; *d*, FLAT VALVE; *i*, INSIDE LEVEL, OR RESERVOIR; *o*, OUTSIDE LEVEL.

marked that the lifting proceeds easiest, although at a slower rate, if it is done just about as fast as the water will promptly pour out. To illustrate this I have computed Table No. II, which gives the amount of movement of a 10-foot trough from point of submergence to pouring level. The lip may be made 2 feet long; thus 12-foot lumber will answer very well for construction.

TABLE I.

AMOUNT OF WATER LIFTED WITH A TROUGH 10 FEET LONG AND 1 FOOT SQUARE, IN CUBIC FEET.

| Lift in feet and tenths | Without a bucket. | With a 1-foot bucket. | With a 2-foot bucket. | With a 3-foot bucket. | With a 4-foot bucket. | With a 5-foot bucket. |
|---|---|---|---|---|---|---|
| 0.1 | 4.15 | 5.15 | 5.65 | 6.20 | 6 75 | 7.25 |
| 0.2 | 3.57 | 4.65 | 5.60 | 5.95 | 6 50 | 7.10 |
| 0.3 | 3 50 | 4.50 | 5.35 | 5.70 | 6.30 | 6.90 |
| 0.4 | 3.30 | 4.15 | 4 85 | 5.50 | 6.10 | 6.65 |
| 0.5 | 3.15 | 4 00 | 4.50 | 5 35 | 6.00 | 6 50 |
| 0.6 | 3.00 | 3.80 | 4.35 | 5.20 | 5 85 | 6.40 |
| 0.7 | 2.80 | 3.65 | 4 25 | 5.05 | 5.75 | 6.35 |
| 0.8 | 2 65 | 3 50 | 4.10 | 4.90 | 5.60 | 6.25 |
| 0.9 | 2.50 | 3.35 | 4.00 | 4.73 | 5.50 | 6.20 |
| 1.0 | 2.45 | 3.15 | 3 90 | 4.65 | 5.40 | 6.15 |
| 2.0 | 1.60 | 2.45 | 3.23 | 4.05 | 4.87 | 5.70 |
| 3.0 | 1 15 | 2 00 | 2.87 | 3 75 | 4.60 | 5.45 |
| 4.0 | 0.87 | 1.75 | 2.60 | 3.53 | 4.40 | 5.20 |
| 5.0 | 0.70 | 1.59 | 2.50 | 3.35 | 4.23 | ..... |
| 6.0 | 0.55 | 1 47 | 2 37 | 3.20 | .. ... | ..... |
| 7.0 | 0.42 | 1 30 | 2.20 | ..... | ..... | ..... |
| 8.0 | 0 30 | 1 20 | ..... | ..... | ..... | ..... |
| 9.0 | 0.18 | ..... | ..... | ..... | ..... | ..... |
| 10.0 | 0.00 | ..... | ..... | ..... | .... | ..... |

TABLE II.

TOTAL MOVEMENT FROM POINT OF SUBMERGENCE TO POURING LEVEL, WITH A 10-FOOT TROUGH.

| Amount of lift in feet. | Without a bucket | With a 1-foot bucket. | With a 2-foot bucket. | With a 3-foot bucket. | With a 4-foot bucket. | With a 5-foot bucket. |
|---|---|---|---|---|---|---|
| 0.1 | 1.20 | 1.45 | 1.55 | 1.60 | 2.10 | 2 30 |
| 1.0 | 2.20 | 2.45 | 2.70 | 3.10 | 3.50 | 4.20 |
| 2.0 | 3.20 | 3.55 | 3.80 | 4.50 | 5.20 | 6.20 |
| 3.0 | 4.20 | 4.65 | 5 00 | 5.90 | 6.80 | 8.00 |
| 4.0 | 5.20 | 5.85 | 6.50 | 7.30 | 8.30 | ..... |
| 5.0 | 6.20 | 6.85 | 7.70 | 8.70 | .. . | ..... |
| 6.0 | 7.20 | 8.00 | 8.80 | ..... | ..... | ..... |
| 7.0 | 8.20 | 9.10 | ..... | ..... | ..... | ..... |
| 8.0 | 9 20 | ..... | ..... | ..... | ..... | ..... |
| 9.0 | .... | ..... | ..... | ..... | ..... | ..... |
| 10.0 | .. ... | ..... | . .... | ..... | ..... | ..... |

A study of the tables shows that it is most effective for lifts of short distances and with the bucket addition. Short lifts are not to be despised. In Holland, to change the current of a canal a lift of one-tenth of a foot is not unusual.

## THE PINUS ATTENUATA (OR PINUS TUBERCULATA) AS A WATER CONSERVER.

BY T. P. LUKENS.

CALAMITIES come upon us as unexpected as they are unwelcomed. The Mission Fathers and the early white settlers little thought of the future possibilities and needs of southern California. With conditions as they then were, every acre could be utilized, for there was water for all the land. Then all the mountains were well forested; the trees were cut; then fire and sheep nearly completed the destruction. The limit of development is now about reached, unless more water can be had for irrigation.

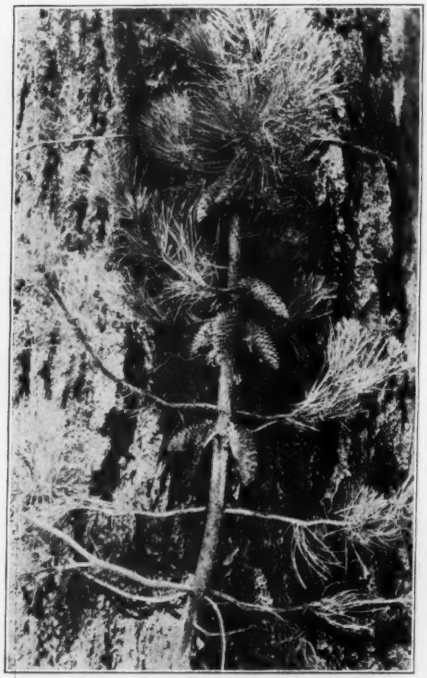
There are two ways to increase the water supply, namely, to build storage reservoirs and to clothe our mountains with trees and see to it that they are not destroyed again. Even to build the reservoirs would be useless unless the watersheds tributary to them be forested, for the reservoirs would soon become filled with silt if the mountains are bare; so the only hope for future development is to bring back the forests. It is an easy problem to perpetuate a forest: When a tree is removed plant another. All conditions are favor-

A THIRTY-ACRE SLOPE THAT WAS BURNED OVER IN 1870. PINUS ATTENUATA (TUBERCULATA) NOW HAS COMPLETE POSSESSION OF THE GROUND. THIS GROVE HAS RESISTED THE FIRES DURING THE PAST TWELVE YEARS.

GROVE OF ATTENUATA SELF-SOWN, WHERE FIRE SWEPT THROUGH IN 1890, DESTROYING EVERY TREE.

able then, but after repeated fires over the length and breadth of the mountains, the conditions are not so favorable for tree growth.

Nature in her wisdom has seemed to provide for such an emergency. Here and there, from San Bernardino to Shasta, we find growing on fire-swept slopes that vigorous and invincible tree, the *Pinus tuberculata*. Not many travelers ever see it, and of those that do



SMALL TREE SHOWING MANNER OF GROWTH OF THE CONES.

but few would notice it except for its strange appearance which its life store of cones give it. The tree is usually small, early bearing, found on sunny slopes of the Cascade Range to the northern Sierra and southward (rarely on the coast ranges) to the San Bernardino Mountains. Its cones grow in circles, strongly declined, narrow and pointed. They are three to eight inches long, and remain on the trees unopened for an indefinite number of years. The outer scales have conical, quadrangular tubercles, terminated by a very short, triangular, firm prickle. The leaves grow three in a sheath, three to seven inches long. It is sometimes called Knob Cone or Hickory Pine. A peculiarity of this tree is the tapering character of its cones at the base, whereby they oppose so little resistance to the growing trunk that the annual layers, instead of crowding off the cones (as in most other species), often envelop them completely. They are sometimes found in large trunks still unopened and the seed good.

The cones are borne in whirls first around the main axis of the tree only. As the tree grows and branches freely, which it will do where not crowded, then cones are borne about the limbs. I have counted as high as 500 cones on a tree 50 years old, each cone containing 124 fertile seed, which are small, there being 20,000 to the pound. The seed have a wing one inch long and one-fourth inch wide. When a fire sweeps through a grove, if severe, it kills the tree. The heat melts the resin with which the cone is sealed, and the second or third day after the fire the winged seeds take flight and plant a far greater area than existed before. Thus after each fire the forest becomes dense, crowding together for protection, until at last they defy the fire, for where they grow so closely together as to occupy all the ground, they will resist fire. This persistence of cone, coupled also with the firm coherence of their scales for an indefinite length of time, is an important fact, for it insures better propagation, if not the very existence of the species. It is found that the seeds in these long closed cones are always in good condition, however old the cones. They seem to declare not only that this species of tree shall be its own survivor, but also that it may extend its dominion over other territory which has been cleared of trees.

So we may expect that through the improvident or wanton conduct of man, while it destroys by fire the noble Sugar and Yellow Pines of our vast forests, this cunning little provident tree, fight-

ing now for room to stand upon and crowding close together for greater strength, shall, after long waiting and at last fire-killed, unlock its store of life germs and scatter them with sailing wings on the wind to reforest the mountains.

No tree shows more greenness or symmetry of growth than the *Pinus tuberculata* when not crowded. Its desire seems to be to cover the ground, if not in numbers, then with wide-spreading branches. Trees are to be found 150 feet high, with a body two to three feet in diameter. I have never found one of them dying from old age. They thrive where other trees would not attempt to grow—on the steep, hot, rocky slopes. Their roots penetrate every little crevice to an incredible depth, opening channels for the conservation of water and mulching the surface with their foliage.

The inclosure of the cones in the body of the tree precludes their use for timber, as the cones are too hard to be sawed, thus increasing their insurance of life, for if they were good for lumber when they are grown some one with a gold bug in his eye would devise some way to remove them. Their usefulness consists entirely in their value as water-conservers and to prevent erosion. The more humid regions of northern California, Oregon, and Washington, so rich in forests, will, if rationally harvested, perpetually supply the coast with lumber. Even the higher portions of our southern mountains produce much good timber, and if harvested by trained foresters in a rational manner could be made to yield a profit and perpetuate the forest; but the slaughter practiced now of the forests on the San Bernardino and San Jacinto reserves is sure to result in serious loss, not only in the immediate depletion of the water supply, but by reason of the lopings (which consist of at least one-half of the tree bulk) being left to dry and be burned, the soil that has been hundreds of years accumulating is destroyed. The rains carry the silt down onto the valley lands and the summer streams vanish. This provident pine tree, if helped a little by man, will in time cover all our mountain slopes, and store our rainfall, and defy the fiery element.

## ALKALI FROM IRRIGATION.

By Professor R. H. Forbes,

Director Arizona Agricultural Experiment Station.

THE University of Arizona has carried on some interesting experiments in connection with the rise of alkali in the soil of the Salt River Valley. Some of the orchards were found to be in an unsatisfactory condition through the increase of alkali, resulting from the methods of irrigation practiced there. The soil before cultivation has been observed to contain from .02 to .09 per cent of salts, evenly distributed through the soil as deeply as 10 feet.

Irrigation, however, both by the addition of salts contained in the water and usually by the concentration of salts originally in the soil, has greatly changed the amount and distribution of alkali. Salt River becomes strongly charged with soluble salts, especially in hot weather at a time of low water, through evaporation and the presence of seepage from irrigated districts above.

These summer waters are also scant in quantity and, especially in the orchard practice of southern Arizona, are rushed hurriedly through shallow furrows over the area to be irrigated, wetting only the surface layers of soil. Under such conditions uncultivated tree rows and ridges and insufficiently cultivated surfaces in general lose by evaporation a large part of the water applied in irrigating. The alkali follows the soil water in its movements either up or down. As the soil water, through capil-

lary action, comes to the surface and evaporates, the soluble salts are left at or near the top of the ground. A shallow wetting of the soil also leads to the development of tree and plant roots near the surface, for plant roots also must develop best where requisite amounts of water are accessible. As a result of shallow irrigation and insufficient cultivation, therefore, the orange orchards (which were more particularly studied) of this district were found with root systems in considerable part developed within a foot of the surface in direct contact with accumulated alkali salts left by evaporation.

Flooding, where water is available and drainage good, is the best means to dispose of alkali. The occasional river floods could be utilized for this purpose, such water being least salty (as low as 52 parts in 100,000 observed) and abundant for a little time. Deep borders and six or eight inches depth of water will be found more effective than operations of less determined nature. After the salts are leached down into the lower soil, the ground must be deeply and thoroughly cultivated to prevent surface evaporation and consequent return of alkali.

Deep irrigation in subsoiler furrows has the merit that a scanty head of water is made to penetrate quickly and deeply into the soil, leading to a deeper establishment of root systems and allowing less surface evaporation. The employment of the subsoiler, however, does not do away with the advisability of distributing surface accumulations of salts downward through the soil by flooding, as soon as the water supply will permit. These measures have proved entirely effective in certain of the orange orchards of southern California.

The shading of the soil, especially in summer, by heat and drouth-resisting crops, checks surface evaporation to a useful extent and lessens the rise of alkali in proportion. German and common millets are probably suitable for this purpose in Arizona.

To some extent, also, such crops as sour clover, barley, or millet take up alkali salts, which are removed with the crops from the soil. A heavy crop of sour clover, for instance, weighing 50,000 pounds, green, will contain about 1,000 pounds of ash, largely composed of alkali salts from the soil. This, however, is approximately only one-third of what would be added in an acre foot of concentrated summer water. Moreover, if plowed under as green manuring, the salts taken up by the crop are returned to the soil from which they were taken.

## AN ELM TREE STRUCK BY LIGHTNING.

By L. H. Pammel,

Professor of Botany, Iowa State College of Agriculture and Mechanic Arts.

IT is a well-known fact that many kinds of trees are frequently struck by lightning. The writer has observed among the deciduous trees the following: White Oak (*Quercus alba*), the Red Oak (*Quercus rubra*), Bur Oak (*Quercus macrocarpa*), Black Oak (*Quercus velutina*), the Hickory (*Hicoria ovata*), and the American Elm. Of the conifers which have come under the writer's observation, the Lodgepole Pine (*Pinus murrayana*) and the Rocky Mountain Balsam (*Abies lasiocarpa*) may be mentioned. Many other trees are frequently struck by lightning, as numerous observers attest. In western Wisconsin, where the writer spent his boyhood, it was not an uncommon thing to find a score of trees struck by lightning on my father's farm every season. It is a general belief among country people there that the oak is much more frequently struck by lightning than any other species. This opinion is probably not well founded. However, for this reason, few people in that vicinity will plant the oak for a shade tree. The oaks would naturally be struck

more frequently because they are most common along the upper Mississippi.

Although I have seen many trees struck by lightning, I have never been fortunate enough to see a fire start from a stroke of lightning, except in an old elm tree on the college farm during the fall of 1900. I desire, therefore, to put this case on record. The tree in question was an old elm about 125 years old, standing alone in the Squaw Creek bottom. During the month of May a strong gale broke off the leader and a large lateral branch. During a heavy rainstorm in the fall the tree was struck by lightning and started to burn, as the figure indicates. I was not present, but a quarter of an hour later during the rain the tree was still burning and continued to do so during the entire day and part of the next. It was some 60 feet up to the point where the fire occurred. There was no evidence that this fire was started by some one. The conductor on the college motor did not see a fire in the tree twenty minutes previous, when going out to the college. It seems, therefore, a pretty clear case of a tree starting to burn from a stroke of lightning.

A second case may be referred to in this connection. Last summer in the Uintah Mountains (Utah) the writer saw a small clump of *Abies subalpina* which had been partially burned. The fire evidently did not come from the ground, as there was no evidence of fire in the leaf mold surrounding the trees. Mr. Lummis and Mr. Buchanan, who saw the clump of trees, also concluded that the fire was started by lightning. Professor Coville in his paper on sheep-grazing in the Cascades refers to an interesting case of fire starting from lightning. While campers, sheep herders, and others may start forest fires, some fires are undoubtedly started by lightning.

AN AMERICAN ELM TREE STRUCK BY LIGHTNING. THE DARKENED AREAS SHOW WHERE THE TREE WAS BURNED.

## FORESTRY AND PLANT ECOLOGY.

By Ernest Bruncken,

Secretary Wisconsin State Forestry Association.

NOW that the systematic treatment of woodlands according to silvicultural methods has been set fairly on its feet in the United States, one of the principal duties of foresters will be to determine the silvicultural characters of the multitudes of tree species with which we have to deal in this country. Very little is known as to the adaptability and fitness of any given tree for profitable forest culture in any given locality. Nine-tenths of the information existing as to the treatment demanded even by the best known species, in the

eastern half of the country, has been derived from gardeners and nurserymen, and does not usually apply to trees grown under forest conditions. To gather empirically definite data as to the behavior of these species under the conditions of a cultivated forest will take a hundred years or more, as it did in Europe.

In this predicament foresters may derive valuable help from a branch of botany which has within the last eight years received an attention much greater than ever before, and promises valuable results for the future, both of a scientific and practical nature. This is the science of plant ecology.

The term ecology is of comparatively recent origin. It may be defined as the science of the manner in which plants adapt themselves to their environment. It may be divided into two divisions. Either one may examine the structure and life history of plants with a view of discovering the structural and functional modifications produced in them by the conditions of their life, or he may investigate the distribution of plants over the surface of the globe, and determine the manner in which it has been influenced by such adaptations. On the former side ecology is related to morphology and physiology; on the second to phytogeography. Both sides, however, are so closely connected that it is quite impossible to study the one without the other.

As yet the study of both sides of the new science is still in its infancy. One may say that so far hardly more has been done than to sketch the outline of its ruling principles, and even that to some extent not more than provisionally. It has been ascertained in a general way that certain structural and physiological peculiarities fit a given species for life under certain conditions of soil, climate, and so forth, and wholly or relatively unfit it for life under other conditions. The detailed knowledge of such structures and life processes has progressed a certain distance; much more remains to be done. The perfect knowledge, the goal toward which the science works, may be described as the ability to state with certainty, from the character of a plant, to what particular conditions of life it is best adapted; and, on the other hand, from the peculiarities of the conditions prevailing in any particular locality, to say with equal certainty what plants are best adapted to grow therein.

It is evident that long before this goal is reached—in fact, from the moment when these questions can be answered with a fair amount of probability—such knowledge may be made a valuable guide in the practical work of the forester. Of course, in a very general way, the forester has always used ecological data. We have always known that White Oaks cannot be grown profitably in a cypress swamp, and that the Mahogany tree of Central America will not flourish in a Minnesota pine barren. But this rudimentary knowledge refers mostly to the great regional divisions of climate and soil condition. The problem that presses upon the forester is: How can I find out what trees generally adapted to the environment of my region are best adapted to each of the great variety of local conditions with which I have to deal? It is well understood that the mere fact of the prevalence or absence of a species in a given place is no safe criterion of its special fitness. The historical factor, well understood by phytogeographers, may have come into play—that is, either the seed of some well-adapted tree may have never reached the place or a tree which was fairly fit may have been driven out by a fitter competitor; yet this victim of the struggle for existence may be the most valuable for the forester, and may be very well able to reconquer the ground if helped by man.

To answer this question, ecology will soon be a valuable aid to the forester. Numerous botanists in all parts of the country are now cultivating this field. Many of the data gathered by foresters during valuation surveys and at other times are distinct additions to the data of ecology. Many more could be easily collected by them if their attention was called to the subject. A forester is supposed to be a fair botanist, and ought to be easily able to follow the technical discussions of the ecologist. A close alliance between the two will be of the greatest mutual advantage.

# FORESTRY AND IRRIGATION IN CONGRESS.

MAY, 1902.

**May 1.**

(House.) By Mr. Sutherland, from the Committee on Irrigation of Arid Lands, to which was referred the bill of the House (H. R. 3088) to regulate the use by the public of reservoir sites located upon the public lands of the United States, reported the same without amendment, accompanied by a report (No. 1851); which said bill and report were referred to the House Calendar.

**May 2.**

(Senate.) Mr. Hansbrough submitted an amendment proposing to grant to the State of North Dakota 30,000 acres of the unappropriated public lands of that state, to aid in the maintenance of a school of forestry, which institution has been established by the legislature of that state and located at the village of Bottineau, etc., intended to be proposed by him to the sundry civil appropriation bill; which was referred to the Committee on Appropriations and ordered to be printed.

**May 5.**

(Senate.) Mr. Dolliver submitted an amendment authorizing the Secretary of War to lease any stone or grazing lands within the Fort Sill Military Reservation and wood reserve belonging thereto, in the Territory of Oklahoma, and use the proceeds of such leases for the support and benefit of the Apache Indians now held as prisoners of war on that reservation, intended to be proposed by him to the Army appropriation bill; which was referred to the Committee on Military Affairs and ordered to be printed.

(Senate.) Mr. Clark, of Wyoming, introduced a bill (S. 5657) to prevent discrimination in grazing permits on the Uintah Forest Reservation; which was read twice by its title and referred to the Committee on Public Lands.

(House.) Mr. Emerson, from the Select Committee on the Census, to which was referred the joint resolution of the House (H. J. Res. 182) authorizing the Director of the Census to compile statistics relating to irrigation, reported the same without amendment, accompanied by a report (No. 1888); which said joint resolution and report were referred to the House Calendar.

**May 6.**

(Senate.) Mr. Platt, of New York, presented a petition of the Audubon Society of the State of New York praying for the enactment of legislation for the protection of game in Alaska, and for the transfer of certain forest reserves to the control of the Department of Agriculture; which was referred to the Committee on Forest Reservations and the Protection of Game.

**May 7.**

(Senate.) Mr. Mitchell introduced a bill (S. 5705) granting a right of way to the Oregon and Southeastern Railroad Company within the Cascade Forest Reserve, in the State of Oregon; which was read twice by its title and referred to the Committee on Public Lands.

**May 8.**

(Senate.) Mr. Platt, of New York, was directed by the Committee on Printing to report a joint resolution providing for the printing of 17,500 copies of Bulletin No. 24, Department of Agriculture, entitled "A Primer of Forestry," and asked for its immediate consideration.

The joint resolution (S. R. 95) providing for the printing of 17,500 copies of Bulletin No. 24, Department of Agriculture, entitled "A Primer of Forestry," for the use of Congress and the Department of Agriculture, was read the first time by its title and the second time at length, as follows:

"Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That there be printed 17,500 copies of Bulletin No. 24 of the Division of Forestry

of the Department of Agriculture, entitled 'A Primer of Forestry;' 2,500 copies for the use of the Senate, 5,000 copies for the use of the House of Representatives, and 10,000 copies for the use of the Department of Agriculture."

There being no objection, the joint resolution was considered as in Committee of the Whole The joint resolution was reported to the Senate without amendment, ordered to be engrossed for a third reading, read the third time, and passed.

**May 9.**

(Senate.) Mr. Mitchell asked unanimous consent that the unfinished business be temporarily laid aside, and that the Senate proceed to the consideration of the House bill No. 4393. There being no objection, the Senate, as in Committee of the Whole, proceeded to consider the bill (H. R. 4393), reserving from the public lands in the State of Oregon as a public park for the benefit of the people of the United States and for the protection and preservation of the game, fish, timber, and all other natural objects therein, a tract of land herein described, etc. It provides that the tract of land bounded north by the parallel 43° 4′ north latitude, south by 42° 48′ north latitude, east by the meridian 122° west longitude, and west by the meridian 122° 16′ west longitude, having an area of 249 square miles, in the State of Oregon, and including Crater Lake, shall be reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart forever as a public park or pleasure ground for the benefit of the people of the United States, to be known as Crater Lake National Park, etc.

The bill was reported to the Senate without amendment, ordered to be printed to a third reading, read a third time, and passed.

**May 10.**

(Senate.) A message was received from the House announcing that it had passed the following bills:

Concurrent resolution of the Senate to print 3,200 additional copies of the bulletin entitled "Irrigation Investigations in California, Bulletin No. 100, United States Department of Agriculture, Office of Experiment Stations, 1901."

The message also further announced that the House had passed a concurrent resolution (No. 49) to print 1,000 copies of the Preliminary Description of the Geological and Water Resources of the Southern Half of the Black Hills and Adjoining Regions in South Dakota and Wyoming, recently prepared by Nelson Horatio Darton, in which it requested the concurrence of the Senate. The concurrent resolution was agreed to.

The Public Printer estimates the cost of this publication at $1,423.

(House.) Resolved by the House of Representatives (the Senate concurring), That there be printed 10,000 copies of Senate Document No. 84, being a message from the President of the United States, transmitting a report of the Secretary of Agriculture in relation to the forests, rivers, and mountains of the Southern Appalachian region, of which 1,500 copies shall be for the use of the Senate, 3,000 copies for the use of the House of Representatives, and 5,500 copies for the use of the Department of Agriculture.

The Public Printer estimates the cost of this publication at $16,350.

**May 13.**

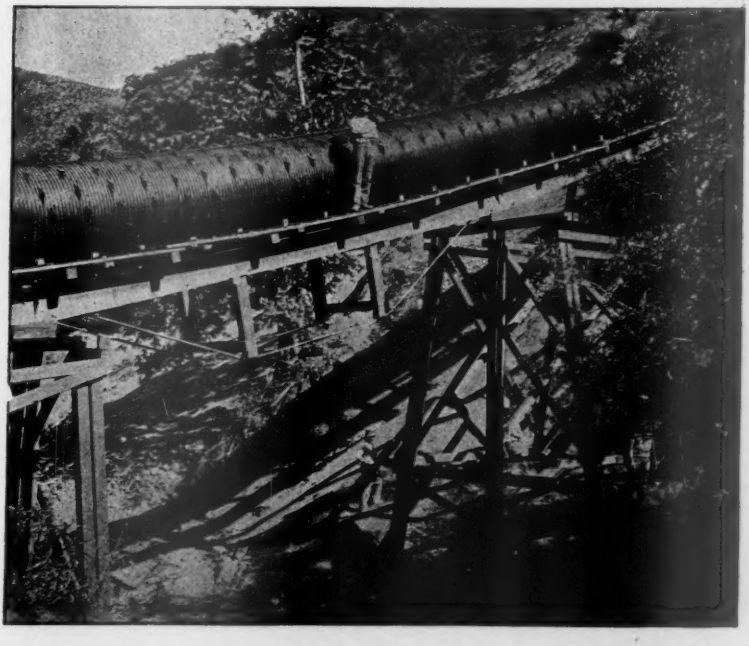
(Senate.) Mr. Simon, from the Committee on Irrigation and Reclamation of Arid Lands, to whom was referred the bill (S. 1969) to conserve the flood waters of Lake Tahoe, in the States of California and Nevada, and to regulate the outflow thereof, reported it with an amendment, and submitted a report thereon.

(House.) By Mr. Kern: Resolutions of Zealous Lodge, No. 217, Locomotive Firemen, of East St. Louis, Ill., favoring the irrigation bill as amended by the Senate. To the Committee on Irrigation of Arid Lands.

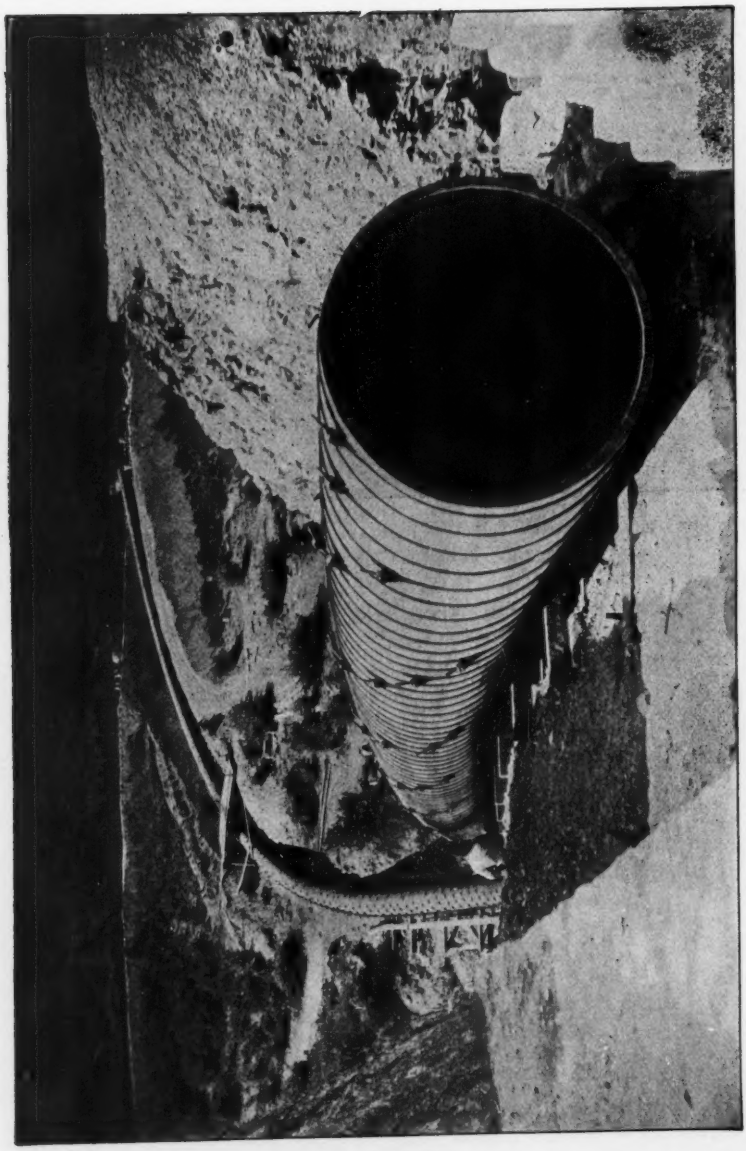
**May 14.**

(House.) By Mr. Griffith: Petition of National Association of Manufacturers in favor of a system of national irrigation. To the Committee on Irrigation of Arid Lands.

CONVEYANCE OF WATER FOR IRRIGATION IN STAVE PIPES. OLD FLUME AND NEW REDWOOD STAVE PIPE REPLACING IT, REDLANDS CANAL, CALIFORNIA.



REDWOOD STAVE PIPE, SANTA ANA CANAL, CALIFORNIA. REDWOOD IS CONSIDERED THE MOST VALUABLE WOOD FOR USE IN CONSTRUCTING STAVE PIPE.



REDWOOD STAVE PIPE (52 INCHES IN DIAMETER) CROSSING WARMSPRINGS CANYON, NEAR REDLANDS, CALIFORNIA.

(House.) By Mr. Mann: Petition of the Board of Trade and the citizens of Chicago, Ill., in support of the House bill 3057, for the enactment of irrigation legislation. To the Committee on Irrigation of Arid Lands.

**May 21.**

(Senate.) Mr. Burrows presented a petition of Lodge No. 533, Brotherhood of Locomotive Firemen of Opechee, Mich., and a petition of the Trades Council of Battle Creek, Mich., praying that the appropriation for the United States Geological Survey be increased from $100,000 to $200,000, and also for the adoption of a proposed amendment to the irrigation bill; which were referred to the Committee on Appropriations.

**May 23.**

(Senate.) Mr. Penrose presented a memorial of Mount Chestnut Grange, No. 133, of Butler County, Pa., remonstrating against the passage of bill providing for the irrigation of arid lands; which was referred to the Committee on Irrigation and Reclamation of Arid Lands.

**May 29.**

(House.) By Mr. Ketcham: Letter of P. T. Kirby, secretary of Trade and Labor Council, Poughkeepsie, N. Y., urging the passage of the Senate amendment to the sundry civil bill increasing the appropriation to the U. S. Geological Survey and favoring the amended irrigation bill and House bill 6279. To the Committee on Appropriations.

## RECENT PROGRESS IN DENDRO-CHEMISTRY.

By Wm. H. Krug,

Bureau of Chemistry, U. S. Department of Agriculture.

STUDIES on Colophony. W. Fahrion (Ztsch. angew. Chem., 14, 1197; 14, 1252). American colophony consists chiefly of an amorphous modification of sylvic acid, $C_{20}H_{30}O_2$. Sylvic acid readily absorbs oxygen, forming primarily the superoxides insoluble in petroleum ether and then oxyacids soluble in this solvent. Colophony also contains neutral, non-saponifiable substances, partially volatile on heating, which have been produced by secondary oxidation processes, and a small amount of a substance which is probably an acid anhydride.

Determination of Free Sulphuric Acid in Leather. Pæssler and Sluyter (Bull. de l'Assoc. belge des Chim., 15, 313). A discussion of the sources of error in Procter and Searles', Balland and Maljeans', Jeans and von Schroeder's methods.

Effect of Tanning Extracts Containing Bisulphites on Leather. Parker and Gansser (Journ. Soc. Chem. Ind., 20, 1085). The authors show by a series of experiments that the sulphurous acid present in such extracts has absolutely no deleterious effect on the leathers. All leathers were found to be alkaline and contained neither sulphurous nor sulphuric acid.

The Occurrence of Maltol in the Needles of *Abies alba*, Mill. W. Feuerstein (Zeitsch. Gesammt. Brauwes, 24, 769). On shaking the aqueous extract of the needles (dried at a low temperature) with ether or chloroform, a crystalline substance was obtained, which was found to be maltol. It was absent in needles collected in September, and appears to occur only at certain periods of vegetation.

The Active Constituents of Guaiac Wood and Guaiac Resin. E. Schaer (Arch. Exp. Pathol. u. Pharmak., 47, 128). Guaiac bark contains a considerable quantity of saponin, which also occurs in the wood and is found in traces in the resin.

The Adulteration of Shellac, K. Dieterich (Chem. Rev. Fett u. Harz. Ind., 8, 244). The different solubility of colophony in various organic solvents

furnishes valuable data for the detection of adulteration. A method for the determination of the solubility is described.

The Sesquiterpene of Eucalyptus Oils. H. G. Smith (Chem. News, 85, 3). The red coloration produced on testing the oils for eucalyptol with phosphoric acid is due to a sesquiterpene which occurs chiefly in oils boiling above 255° C. The name "Aromadendrene" is proposed.

The Coloring Matters of Green Ebony Wood. A. G. Perkin and S. H. C. Briggs (Journ. Lond. Chem. Soc., 81, 210). Green ebony is a wood which has been used in England until quite recently, and is probably obtained from *Excoecaria glandulosa* or *Jacaranda ovalifolia*. It contains small quantities of two crystalline coloring matters—excoecarin $C_{13}H_{12}O_5$ and jacarandin $C_{14}H_{12}O_5$. The wood also contains two resins, one of which is a yellow dyestuff, while the other has no dyeing properties.

The Occurrence of Tannin, Starch, and Sugar in *Acer pseudoplatanus* in the First Year of its Growth. J. Hämmerle (Ber. deutsch. botan. Gesell., 19, 538).

The Adulteration of Turpentine with "White Spirit." A. and P. Andouard (Journ. Pharm. Chim. (6) 15, 99). The "white spirit" had the following properties: Specific gravity = 0.817 at 15° C., (a) d = −1°.2, initial boiling point = 150° C., bluish fluorescence. The residue at 205° C. amounted to 42 per cent of the original volume, had a yellowish color, empyreumatic odor resembling petroleum, and a slight levorotation (−0°.2). Turpentine adulterated with "white spirit" can be recognized by the bluish fluorescence, much decreased rotary power, change in density, incomplete evaporation at ordinary temperature, and increased residue on distillation. The "white spirit" is evidently not identical with ordinary benzine.

The Composition of Norwegian Wood Tar. J. A. Mjöen (Zeitsch. angew. Chem., 15, 97). Analyses of tar prepared in retorts and in meilers, comparisons being made with Austrian beechwood and Bohemian Pine Tar.

The Action of Crystalline Arsenic Acid on Pinene. P. Genoresse (Compt. rend., 134,360). On heating 1,000 grams of pinene with 250 grams of arsenic acid, using a reflux condenser, about 60 per cent of terpinene with small quantities of cymol and terpineol are formed. The method can be technically applied to for the production of terpinene.

## RECENT PUBLICATIONS.

**Practical Forestry for Beginners in Forestry, Agricultural Students, and Woodland Owners.** By Dr. JOHN GIFFORD. Illustrated. Pp. 284. Price, $1.20 net. D. Appleton & Co., New York.

A timely book on the subject of forestry is Dr. John Gifford's "Practical Forestry," a handsomely printed and illustrated volume just received. The keynote of the book is stated in the preface as follows: "In the following pages the author has endeavored to include those parts of the science and art of forestry which are of interest and importance to the general reader and beginner."

Dr. Gifford has wisely decided that the average American needs to be educated up to a clear understanding of the meaning and aim of forestry. With this idea in view he has written a book that contains a good general description of what forestry is, with just enough technical information to prepare the beginner for the more intricate problems connected with forest management.

The book is divided into four parts. Part I contains a chapter on the meaning of forestry, one on farm woodlots, and then follows an extended description of the make-up of a typical forest, the physical influence exerted by forests, and the geographical distribution of forests. Part II is devoted to a discussion of "The Formation and Tending of Forests," while in Part III the "Industrial Importance of Forests" is noted, with descriptions of the various industries and products of the forest.

There is much valuable information contained in Part IV, where the principal federal and state forest reservations are noted. This part also contains a list, with a short description of each, of fifty American forest trees, including twenty-five conifers and twenty-five hardwoods.

Dr. Gifford's wide experience as a teacher,

practical forester, and his opportunities for observation through wide traveling fit him especially for writing a book on forestry. "Practical Forestry" is a valuable book for the general reader, and also should be widely used as a text-book. It is a valuable addition to forest literature.

**Wild Life of Orchard and Field.** Papers on American Animal Life, by ERNEST INGERSOLL, author of "Nature's Calendar." Illustrated from photographs. Pp. 347. Price, $1.40 net. Harper & Brothers, New York.

Mr. Ernest Ingersoll, the well-known naturalist, has written a delightful book, entitled "Wild Life of Orchard and Field," that tells of the birds and animals near home, such as the swallow, squirrel, woodchuck, raccoon, weasel, and many others well known to all. Unlike many other books that treat of the animals of distant lands, little known to the average reader, this volume gives an intimate picture of the really many wild creatures that still exist in the average farm community.

From "Wild Life of Orchard and Field." Copyright, 1880–1902, by Harper & Brothers.

The author writes of the "small deer" from a deep knowledge of their habits, for Mr. Ingersoll has studied in the fields these many years, and he has done the public a great service in producing such a readable book on the wild life that is near all of us. It is quite possible for every one to study the creatures mentioned in this book, and readers will find much new and valuable information concerning the host of them mentioned. It is doubtful if the average reader appreciates the variety of wild life still existing in even our most thickly settled communities. "Wild Life of Orchard and Field" is a charming book, and one all nature students should possess. It is splendidly illustrated from photographs.

A bulletin entitled "The Hardy Catalpa" has just been issued from the Kansas Experiment Station. It gives a very full botanical description and historical outline of *Catalpa speciosa*, and follows with a description of methods of catalpa culture and brief accounts of some of the larger commercial plantations, among them the Tincher plantation at Wilsey, the Yaggy plantation at Hutchinson, and the Kansas City, Fort Scott and Memphis Railroad plantation at Farlington, all in Kansas. Some of these plantations are shown to be very profitable to their owners, though not more than twelve or fifteen years old. The bulletin contains 115 pages and 40 illustrations, and will be very interesting and useful to those engaged in catalpa culture.

**According to Season.** By FRANCES THEODORA PARSONS. With 32 full-page illustrations in colors. 12mo, $1.75 net. Charles Scribner's Sons, New York.

A new and greatly improved edition of "According to Season," by Frances Theodora Parsons, author of those well-known and deservedly popular books, "How to Know the Wild Flowers" and "How to Know the Ferns," has just been issued by the Scribners. The present edition contains several new chapters, and describes our birds, trees, and flowers, as the title indicates, "according to season."

Why we know so little about nature's works the author very aptly states in the following sentence:

"That we know so little, as a people, of our birds, trees, rocks, and flowers is not due, I think, so much to any inborn lack of appreciation of the beautiful or interesting as to the fact that we have been obliged to concentrate our energies in those directions which seemed to lead to some immediate material advantage, leaving us little time to expend upon the study of such objects as promised to yield no tangible remuneration."

Happily, during late years more people can and are turning to nature study. No better proof of this is needed than the great demand for books on nature subjects. "How to Know the Wild Flowers" has sold sixty thousand copies, while the sales of "Wild Animals I Have Known," by Ernest Seton-Thompson, has run up to over one hundred thousand copies. This is a healthful sign

"According to Season" is well written, the author's heart is in what she describes, and altogether it is a most valuable book. The volume is beautifully and appropriately illustrated by thirty-two colored plates, the work of Miss Elsie Louise Shaw. There is a valuable index, and marginal headings throughout the text add value to the book.

This new edition of "According to Season" is a book that deserves a place in every library throughout the country. It is in every way up to the high standard set by the author in her other books.

**Forest Neighbors. Life Stories of Wild Animals.** By WILLIAM DAVENPORT HULBERT. Pp. 240. Illustrated. Cloth, $1.50 net. McClure, Phillips & Co., New York.

"Forest Neighbors" is a delightful book, made up of sketches of well-known inhabitants of the forest. The habits of the beaver, deer, brook trout, loon, porcupine, and lynx have often been described, but it is doubtful if in a more entertaining manner than in this volume The daily life and habits of the above-named creatures are set forth in a clear, truthful way.

The opening sketch, entitled "The Biography of a Beaver," is a most intimate description of that wonderful little animal, unfortunately now so nearly extinct The life of the beaver from its birth to its tragic end in the usual hunter's trap is described in a thorough manner. The following sketches are also "biographies," and Mr. Hulbert shows himself to have been an unusually keen observer of animal life. As the author states in his preface, the material for these stories was collected at his home, on the shores of a lonely little lake in the Upper Peninsula of Michigan.

This volume gives a most intimate and sympathetic view into animal life and nature in general. The beaver and his forest brethren have been most fortunate in their "biographer." "Forest Neighbors" is a book that deserves a wide sale

**Irrigation Practice Among Fruit Growers on the Pacific Coast.** By E. J. WICKSON, M. A., University of California. Bulletin No. 108, Office of Experiment Stations, U. S. Dept. of Agriculture. Pp. 54, plates x.

This is an interesting report on the practice of irrigation by fruit-growers on the Pacific coast. A lot of valuable information is contained in this bulletin, showing the methods and extent of irrigation in the fruit-raising regions of the far western states

**Wonderland, 1902.** By OLIN D. WHEELER. Published by Chas. S. Fee, General Passenger Agent Northern Pacific Railroad. Pp. 111. Illustrated. Price, 6 cents in stamps.

"Wonderland" for 1902 is an unusually handsome publication, descriptive of that part of the Northwest tributary to the Northern Pacific Railway. The leading chapter of this number is a well written and illustrated account of "Mining in Montana" from the early days to the present time.

There are other interesting chapters on the "Northern Cheyenne Indians," "Yellowstone Park," and the "Puget Sound Country." The book is splendidly illustrated throughout and is one of the best publications of the kind that has come to our notice. Readers who desire to know more about the business opportunities, the natural resources, or scenic wonders of the great Northwest will find this little volume of interest and value.

During the month there have appeared in the leading magazines the following articles on forestry and irrigation and kindred topics:

The New Agriculture. W. S. Harwood. *Scribner's*, June.

The Great Southwest. R. S. Baker. *Century*, June.

The New Tide of Northwestern Immigration. Condé Hamlin. *Review of Reviews*, June.

Arizona. Harriet Monroe. *Atlantic Monthly*, June.

Save the Forests and Store the Floods. Geo. H. Maxwell. *Sunset*, May.

A New Era in the Southwest. C. M. Harger. *Review of Reviews*, June.

## PUBLICATIONS RECEIVED.

Transactions of the Royal Scottish Arboricultural Society, vol. xvi, part iii. Pp. 339–530. Illustrated. Edinburgh.

Transactions of the English Arboricultural Society, vol. v, part i. Compiled by John Davidson. Pp. 187. Illustrated.

Forty-fourth Annual Report of the Horticultural Society of Missouri, 1901. Pp. 408. Illustrated.

Annual Report of the Director of Forestry for the Province of Ontario, 1900–1901. Toronto.

The Great Woods and Other Public Reservations of Lynn, Being the 13th Annual Report of the Park Commissioners of Lynn, Mass. Illustrated.

Insect Enemies of the Pine in the Black Hills Forest Reserve, by A. D. Hopkins, Ph. D. Bulletin 32, new series, Div. of Entomology, U. S. Dept. of Agriculture. Pp. 24, plates vii.

Forage Conditions on the Northern Border of the Great Basin, by David Griffiths. Bulletin No. 15, Bureau of Plant Industry, U. S. Dept. of Agriculture. Pp. 60, plates xvi.

Arid Farming or Dry Farming. Bulletin No. 75, Experiment Station of the Agricultural College of Utah. Logan, Utah. Pp. 116. Illustrated.

Forest Endowment of the Pacific Slope, by J. G. Lemmon. Oakland, Cal. Pp. 15.

Provisional Methods for the Analysis of Foods. Bulletin No. 65, Bureau of Chemistry, U. S. Dept. of Agriculture. Pp. 169.

Mexico as a Market for Pure-bred Beef Cattle from the United States, by D. E. Salmon. Bulletin No. 41, Bureau of Animal Industry, U. S. Dept. of Agriculture.

Kentucky Bluegrass Seed, by A. J. Pieters and Edgar Brown. Bulletin No. 19, Bureau of Plant Industry, U. S. Dept. of Agriculture. Pp. 19, plates vi.

Review of Legislation, 1901. Bulletin No. 72, New York State Library. Edited by Robert H. Whitten, Ph. D. Pp. 248.

The Agricultural Gazette of New South Wales, vol. xiii, part 3, pp. 279–373. Illustrated.

(*To be reviewed later.*)

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| Field Book of American Wild Flowers, Mathews | 1.75 |
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# PUBLISHER'S NOTES.

"Three Hundred Miles on the Colorado River" is the title of a neat booklet which gives an account of a hunting, camping, and exploring trip by the boys of Agassiz Hall, a well-known California school. These mid-winter excursions by the students of Agassiz Hall have become annual affairs and add much to the otherwise attractive life of the school.

Agassiz Hall is at Alta, a small station on the Central Pacific Railroad, in the pine forests of the Sierra Nevada Mountains, 3,700 feet above sea-level.

Agassiz Hall is a home school, where teachers and students meet on the intimate personal relationship of a large family. It offers the greatest freedom possible. It is a select school and receives boys only on recommendation. The number of boys received is limited to fourteen. The teaching force is large, so that each boy receives practically private tutoring. Each boy has his own separate room. Boys may keep horses if their parents wish. There is unexcelled opportunity for outdoor recreation, and boys are encouraged to ride, swim, row, fish, shoot, trap, snowshoe, build log cabins, and practice woodcraft as an aid toward developing self-reliance, quickness of observation, and insight. The climate is such that there have been camping parties for one or two nights each two weeks throughout the winter. The boys are taught field work in natural history, and in out-of-school hours several boys have made valuable collections of skins of mammals and birds.

There is conducted, in connection with the school, Camp Agassiz, which is primarily a boys' camp under the direction of the headmaster of Agassiz Hall, who, with his family, makes this camp his summer home. The camp is in the High Sierras, near the famous Glen Alpine Soda Spring and Resort, seven miles southwest of Tallac and 6,700 feet above sea-level. It is open from June 20 to September 10.

The enormous growth of the business of Thomas Meehan & Sons has made it necessary to establish a complete office at their Dreshertown, Pa., Nurseries. This will be under the direct charge of Thomas B. Meehan, who will devote his entire energies to increasing the wholesale branch of the business. The innovation will be made July 1, and after that date all wholesale business will be transacted at Dreshertown. At that place the firm owns 200 acres of land which seem specially adapted for growing high-grade hardy ornamentals.

The Groszmann School, formerly located at Vares, Virginia, but now at "Pinehurst," corner Ft. Washington Avenue and Depot Lane, New York, has been established for the benefit of a small number of exceptional children whose individual needs require physical, mental, and moral treatment by experts. The director of the school, Dr. paed. Maximilian P. E. Groszmann, has wide experience as an educator, principal, and student of and writer on educational science. He was for many years superintendent of the "Ethical Culture Schools" of this city, founded by Dr. Felix Adler, and recognized as a pioneer institution of modern pedagogy. The adoption of genuinely progressive methods, and the promotion of the most cordial relations between teacher, pupil, and parent have always been the chief characteristics of Dr. Groszmann's work. He is assisted by competent teachers.

The practical courses in forestry by Mr. F. von Hoffman, which, as announced in the April and May numbers of FORESTRY AND IRRIGATION, were to be given at Glen Summit, Luzerne County, Pennsylvania, during the present summer, have been indefinitely postponed. This action has been made necessary owing to the destruction by fire of the forests in which the demonstrations were to have taken place.

The severe forest fires throughout Luzerne County during the last week in April passed over the tract used by Mr. von Hoffman as a demonstration forest and ruined his work of last season, making it impossible to begin his courses as announced. While temporarily forced to abandon this work, Mr. von Hoffman will continue his work as landscape architect and forest engineer, as announced in his advertisement on another page of this issue.

We beg to call the attention of our readers to the advertisements in this number of FORESTRY AND IRRIGATION. A number of new announcements appear in this issue, and with these, as in the case of other advertisements, we have satisfied ourselves that they are from reputable business houses. This is to be our policy in admitting advertisers to the pages of FORESTRY AND IRRIGATION: not to accept the advertisements of any but reliable people.

FORESTRY AND IRRIGATION is growing in circulation and influence, and an increasing number of advertisers are taking space in its pages. Our readers can help the magazine by mentioning the fact that they saw the advertisement in FORESTRY AND IRRIGATION when corresponding or dealing with any of the firms whose announcements appear in these pages. This will be a help both to the magazine and to the advertisers, as the latter are anxious to know the effect of their advertisement.

If you have friends interested in the subjects to which this magazine is devoted, send us their names and we shall take pleasure in mailing them sample copies.

THE

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THE

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**FORESTRY AND IRRIGATION is the official organ of the Association, and is sent regularly to all members.**

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*Name*.....

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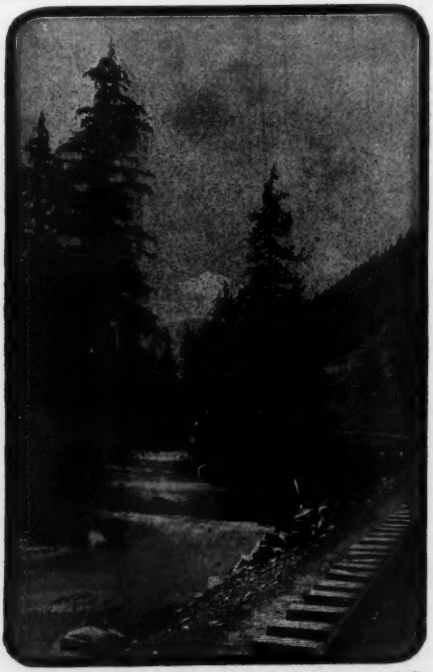

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